RULE.
average yarn count.
breadth in inches.
total threads per sq.in.
wt.in yds.per lb.
a constant that for fine
ds is 756 and for coarse
ds 7~~68~~ 65 etc. Cn is between 700 + 800

$$A = \frac{BxTxY}{C}$$

$$Y = \frac{AxC}{BxT}$$

$$C = \frac{37Y}{A}$$

Use C = 768 etc.

Illustrations.
(1)36",3yard,48x48,13s.& 14s.

$$A = \frac{36x96x3}{768 \atop 745} = 13.5.$$

(2)38½",5.80yard,60x56,30s.&3

$$A = \frac{38\tfrac{1}{2}x116x5.80}{756} = 34.3.$$

How to Popularize

IRRIGATION BONDS

Among Eastern Investors

FROM THE

United States Investor

PUBLISHED BY

FRANK P. BENNETT & CO., INC.

530 Atlantic Avenue, Boston; 31 Nassau Street, New York; 757 Broadway, New York; 308 Chestnut Street, Philadelphia; 208 Corcoran Building, Washington, D. C.; 930 Monadnock Block, Chicago; 215 Fourth Avenue, Pittsburgh, Pa.; 536 Empire Building, Denver, Colo.; 440 Constitution Building, Salt Lake City.

A Cotton Fabrics Glossary

Containing instructions for the manufacture of every known grade and variety of Cotton Fabrics

Price $3.00

FRANK P. BENNETT & CO., INC.
Boston, New York, Philadelphia, Chicago, Washington, Pittsburgh, Salt Lake City.

w = width in inches Then k = $\frac{}{wy}$ and y = $\frac{}{kw}$

y = lineal yards to pound

Number kilos per 100 sq. meters = $\frac{100}{\text{sq. yds. to lb.} \times .836} \times .4536$ pounds

$= \frac{54.25}{\text{sq. yds to lb.}} = \frac{19.53}{\text{width in inches} \times \text{lineal yds to lb.}}$

pound = .4536 kilo

sq. yd. = .836 sq. meter

6 mm. = .23622 inches.

Multiplying threads per 6 mm. by 4.233 gives threads per inch

5 mm = .19685

Multiplying ~~threads~~ per 5 mm by 5.08 gives threads per inch

sq. meter = 10.764 sq. ft. = 1.196 sq. yds.

Cloth 1 yd. wide = .8361 sq. meters per lineal yd.

32 = .7430

28 = .6502

36", 3 yd., 48 x 48, 13s 14s. 48 x 36 + 16 = 1744 ends in warp.

Warp = 1744 + 10% takeup = 1918 yds. warp per yard grey cloth.

$\frac{1918}{13 \times 840}$ = .1756# + 6% size on warp = .186# warp and size

Filling = 36 x 48 = 1728 picks per yd. x $\frac{36}{36}$ = 1728 yds filling.

= $\frac{1728}{14 \times 840}$ = .148#

.186 + .148 = .334# = wt. of one yard cloth.

A Cotton Fabrics Glossary

CONTAINING INSTRUCTIONS FOR THE MANUFACTURE OF EVERY KNOWN GRADE AND VARIETY OF COTTON FABRICS

"PIQUE" OR "MARSEILLES."

The quilted weave, as applied to cotton fabrics, is known among weavers as the "Marseilles" weave. It is a double cloth, the face being a moderately close, plain weave. The back is a very open, plain weave. Between the back and face a soft twisted heavy filling, called "stuffing," is woven. The two cloths are stitched together at frequent intervals in weaving, the stitches being arranged so as to sufficiently bind the two cloths together, and at the same time form an ornamental design or pattern. The "stuffing" between the cloths gives the fabric the embossed effect.

THE FACE

being plain woven is drawn into heddles as for sheeting. The back is also a plain weave, but the back warp is also the quilting warp, and has to be mounted in a "jacquard" harness, unless the pattern is small enough to be produced on a "dobby." Two face threads and one back (or quilting) thread are drawn into each dent of reed. The construction is shown in diagram, Fig. 1.

Two threads of face and one of back warp are drawn into each dent of reed. Back warp is on a separate beam, and contains one-half the number of threads that are in the face

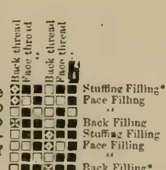


Fig. 1.

Indicates that the thread is raised by the Jacquard only when used for building. Shows same thread when raised by the comber board regularly to form the back. * Back filling same as face.

THIS CONSTRUCTION

calls for a loom with two shuttle boxes at each end of lathe. Large patterns require a "jacquard" attachment, while the small designs may be made on a dobby head; also two warp beams are necessary. In operation the loom throws in one back, two face and one stuffing pick in regular order. To make the embossed effect show up well the back warp is woven with considerably more tension than the face.

AS AN ARITHMETICAL BASIS

for the construction of this fabric, about 11 times the square root of the average hank number on face and back may be used. The "stuffing" should be four times as heavy as the average number used for face and back. On this basis a Marseilles quilt or counterpane, if woven with average No. 35 on face and back, and No. 8¾ stuffing would have:

64 threads per inch of No.	30	warp on	face.
32 " " " "	30	"	back.
64 picks " " "	42	filling on	face.
32 " " " "	42	"	back.
32 " " " "	8¾	" as	stuffing.

and if woven 12 quarters square, would weigh about 3 9-10 pounds per quilt; or take a 30-inch vesting fabric, made of average No. 80 yarn on face and back and 40 stuffing. The stuffing yarn in this case is only twice the weight of the face, but tnere are twice as many picks relatively thrown in. There is no back filling used in vestings. The back, when not used in quilting, is floated. The organization would be:

98 threads per inch on face,	Average No. 80.
98 picks " " "	
98 " " stuffing	No. 40.

The picks are thrown in two face and two stuffing regularly. At 30 inches wide the goods would weigh 4 65-100 yards per pound.

IN THIS EXAMPLE

the average number of the face yarn is given. The fabric looks better and

wears better, if warp and filling on face are alike, but it helps the weaving out wonderfully to have a considerable difference between the two, the warp being from 10 to 20 per cent heavier than the filling.

It is beyond the scope of an elementary article like this to attempt any description of the means used to produce the ornate designs of the fabric. The artist who originates textile designs must draw each design to fit the fabric he is dealing with. Each fabric has its special characteristics as to design, and each also has its limitations. The characteristics and limits of the fabric under consideration may be here stated.

COLOR EFFECTS.

1. Color effects are hardly admissible. The fabric is essentially a white one. The quilting warp is sometimes colored, so as to show a pattern composed of colored lines and dots on a white ground. The design is not thereby altered, for the pattern woven with colored stitching may also be woven entirely white.

2. The fabric admits only of a design of "dots" arranged to produce large designs.

3. In the vestings and fabrics with small patterns, the quilting warp threads, when not raised to make a stitch, are floated. The dots then should be arranged so as to avoid very long floats.

4. On counterpanes the design has to be very large, and has to be produced on a "jacquard" machine of comparatively small capacity. This calls for a design that can be enlarged in the tie-up of the harness and to this end certain parts of the design are arranged so as to admit of several repetitions.

THE NAME "PIQUE"

is now generally applied to this fabric when woven in small patterns within the capacity of the "dobby." This name particularly applies when the goods are to be used for ladies' and children's dresses, men's shirt fronts, etc. However, the fabric that is called "pique" when used for dresses or shirt fronts, would be a "Marseilles" if made up into a man's vest. The name "pique" is probably from the French "piquer," to quilt or prick with a needle. Possibly the name "Marseilles" is also a corruption of the French "matelas," a quilt or mattress.

A CORDED "MARSEILLES."

or "pique" is essentially the same fabric as the figured article, but is woven rather differently. The warp is drawn into a three-shed harness like a common three-shed twill. To produce the corded effect the harnesses are operated by a dobby. Two warps are used as in the preceding cases, one warp having twice as many threads as the other; the quilting warp is drawn into the back harness, the face warp in the middle and front. The pegging plan of dobby chain is shown at Fig. 2.

Fig. 2.

As this weave calls for four picks of face filling and two picks of stuffing in succession, the lathe need only have drop boxes on one end.

QUILT WEAVE GOODS

should be finished so as to preserve, as far as possible, the convexity or puff of the quilting. To this end, after bleaching and sizing, they should be dried on tenter-hooks. The piece goods can be dried on the tentering machine, through which they should run face down. The quilts or counterpanes are handled singly, and are stretched on square tentering frames and dried in a hot room. There is a fabric on the market called "P K," which is often confounded with "pique," the names having the same sound. "P K" is a float weave and the fabric bears no relation to "pique" or "Marseilles.'"

TUCKS.

Cotton Wash Fabric.

A tuck fabric is a single cloth and is made by using two or more warps, is generally composed of all cotton, cotton and silk, and all silk, and can be made on any loom having either a dobby or a jacquard attachment, and single or double box, double box looms, of course, giving great scope for filling patterns.

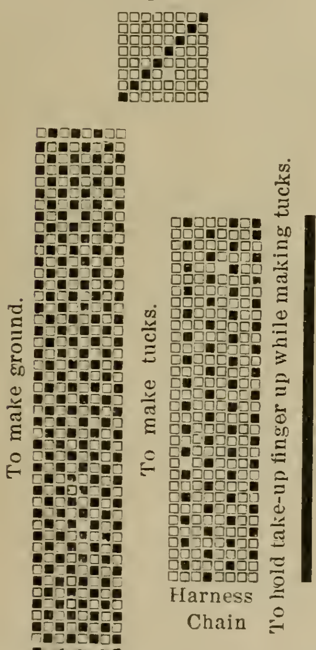
A tuck effect in a cloth is a perfect pleat running across the cloth from one selvage to the other and was used extensively a few years ago in making

fancy bosoms for men's outing or neglige shirts and ladies' waisting, very elaborate effects being produced by weaving ground cloth in colors either harmonizing with or contrasting to that of the tuck.

Two different numbers of filling are used in this fabric, namely, a fine one for the plain ground or flat part of the cloth, and a coarse number for the tuck as the tuck is a filling effect, and the coarse filling causing it to stand out more prominently from the ground fabric than would be the case if fine numbers of filling were used to form the whole fabric.

In making a common tuck effect two

Drawing-in Draft.



beams are necessary, also 10 harness or heddle shafts. The top beam containing the tuck warp is drawn in on the 2, 4, 6, 8th harnesses, and the bottom beam, containing ground warp, is drawn on 1, 3, 5, 7th harnesses, the other two harnesses to work independently for selvage, plain weave being used all the time.

The harness or head chain is pegged to work all the harnesses plain weave at the same time for whatever length of plain ground is desired in the cloth being woven. "For example, if you want 40 picks plain ground cloth before weaving" the tuck, simply peg the chain plain weave on all harnesses for 40 picks. Then to form the tuck peg the chain so as to work only tuck harnesses for plain weave, for number picks necessary to give length of tuck desired, the ground harnesses being at rest.

While the tuck harnesses are working, the take-up motion is temporarily dispensed with by coupling the take-up finger to a jack in the head motion by running a strap over the top of the loom and down the side. After having woven the desired number of picks to form the tuck, as the loom turns over, all the harnesses are set working plain weave, and as the first pick of the chain operates the head motion, the take-up finger drops, the take-up motion is again in gear, and the reed beats in, the pick binding the turn and throwing it out from the ground fabric.

This fabric is generally made to finish from 2½ to 3½ ounces and 27 inches wide.

CONSTRUCTION COMMON TUCK.

1,300 reed, 2 ends per split, 1 end per heddle, 29 inches width in reed, including selvage; 1036 plus 16 splits, 2072 plus 64 ends. Ground warp and tuck warp, 1-40s cotton; 70 picks per inch 1-40s cotton filling. 7 per cent shrinkage in width in weaving and finishing; 10 per cent shrinkage length finishing and weaving.

Tuck pattern: 46 picks 1-40s cotton for plain ground; 32 picks 2-20s cotton for tuck. Selvedge, 4 in a heddle and split. Finish, about 3½ ounces.

SCRIM.

Scrim. A loose woven, flimsy-looking cloth, composed entirely of two-ply cotton yarn, both warp and filling, and resembles a fine meshed fish net.

Scrim is usually made in bright colored stripe and plaid effects. It is peculiarly adapted to the draper's art, as it is a light-weight creation, therefore soft and pliable; it is also used as a fly net for horses in the summer time.

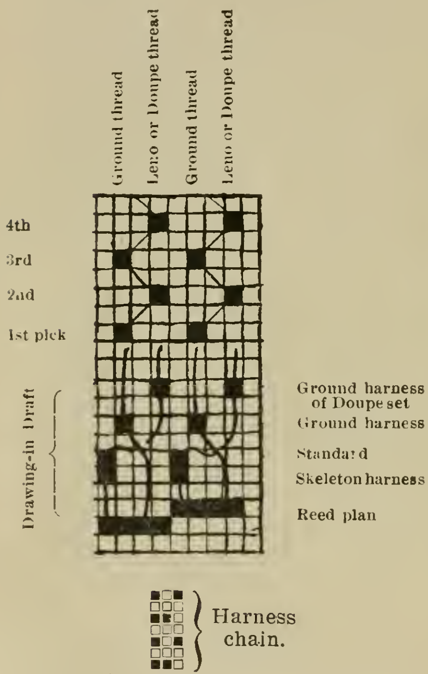
Scrim is made of 2-20s cotton, dry color, in both warp and filling, and as a fabric requires nothing in the nature of a finish except being run through a hot press, simply to smooth the wrinkles which may occur during the process of weaving.

By using 3-10s and 4-10s cotton warp and filling, and of course in proper pro-

portions, we produce hammocks and material for laundry bags with this same scrim weave, or, to be correct, gauze weave. Scrim can be woven in any power loom, but best results are obtained by using a light running loom such as Bridesburg or Mutual. The

SCRIM WEAVE OR LACY EFFECT

can be produced by using a regular doupe set of harness, but the best, quickest and cheapest method is by using an attachment known as the Ashoff



This weave applies to a fabric (scrim) in which the Doupe set is working every pick, and each Warp thread working with a mate thread, and producing perfect Leno effect.

NOTE. In drawing in the Ground thread crosses over the Doupe thread.

motion, which is an improved set of harness or heddle and heddle shafts built especially for this kind of effects in cloth. This motion consists of two heavy wooden frames built similar to heddle frames and suspended in the loom from the top roller, in the manner in which old roller looms were equipped for weaving gingham.

In place of heddles these frames are filled with a coarse reed, in accordance with number of splits per inch required for fabric; these reed dents are plugged with lead, alternately top and bottom, and two ends are drawn straight through both harnesses.

THE ASHOFF MOTION

makes a shed in the regular roller loom style or by treddle or cam, and has likewise a sideway movement, which is obtained by placing a small eccentric on the bottom loom shaft.

Near the side of loom this eccentric is connected by a one-half inch iron rod with a pair of bevel gears which are fastened on the loom frame at a point equal to the centre of the shed. These gears are in turn coupled by smaller rods to the heddle frames, and create the side motion, which allows the threads to operate in a sort of rolling motion or, in other words, each thread rolls half-way round its mate thread and the filling pick, binding it in, and on the next pick the roll is reversed, and this creates the lacy effect. Use regular 2-20s cotton yarns and set the warp about 44 inches in the reed, 20 ends and 20 picks per inch; will weigh about 1½ ounces and measure about 36 inches wide from loom.

FOR LAUNDRY BAGS

use 4-10s cotton in the gray; set 30 inches in reed, three ends and three picks per inch; will run 25 inches from loom; no finish.

In hammocks very elaborate effects are made with the scrim weave as applied to the Knowles or Crompton harness loom. Diamond twill and fancy colors are a favorite combination and make good selling line.

4-10s cotton yarn (warp filling); 42 inches in reed; 14 ends per inch; one end per dent; 14 picks; stripe patterns. No finish as cloth is made into hammocks straight from loom.

HAMMOCK CRASH.

This cloth, as the name implies, is used in the making of hammocks. It is made strong and durable to stand the strain and wear that it is subjected to and can be woven on almost any ordinary loom. It is generally made in three grades, viz., best, medium and low.

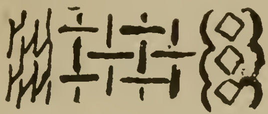
The best grades are generally made on the jacquard loom, so that very elaborate patterns may be introduced.

A 400 tie-up is generally used, but any tie may be used according to the requirements of the design and quality of the cloth.

The warp is generally composed of three or four or more colors of yarn, the colors being very bright and contrasting, such colors as green, red,

gold and black taking a prominent part.

The design is generally an extensive and elaborate one and in stripe form, but designs of the following character are sometimes employed, with particulars as follows:



Warp: ⅜ cotton, as sample, 20 ends per 1 in., 10 x 2 reed, 46 in. wide in reed.

Filling: ⅜ cotton, as sample, 18 picks per 1 in.

The warp is woven with an even tension and where a gauze or leno weave is used, two or more beams are necessary and the necessary slackners etc.

When the warp is composed of several colors of yarn, the filling is generally used undyed or in one solid color.

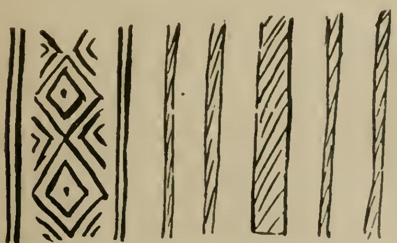
Semi-fancies (generally of medium quality) and plain or lower grade cloths may be woven on harness looms (16 to 24 harness being employed). Plain or lower grade cloths are sometimes woven in looms having a cross-weaving or gauze-reed attachment when the weave is a gauze or leno, which is generally the case.

These cloths (medium grade) are not made as strong and compact as the first quality; the particulars being as follows:

Warp: 14 ends per 1 in., ⅜ cotton, 7 x 2 dent reed.

Filling: 12 picks per 1 in., ⅜ cotton.

The weave is generally a semi-fancy one, i. e., plain weave for 2 in. or 3 in. and then a gauze stripe or gauze stripes at irregular intervals across the warps. The colorings in warp are similar to the first grade colorings, and the design is less elaborate, sometimes on the following order:



Repeat several times.

The cheapest qualities are much lighter in weight and more open in texture, the particulars being as follows:

Warp: 8 ends per 1 in., ⅜ cotton, 8 dent reed x 2; mess every other dent.

Filling: 7 picks per 1 in., ⅜ cotton.

The weave is generally a gauze one, one that is largely used, being 3 picks plain and 1 pick gauze.

This quality is often made with undyed cotton warp and filling and is dyed in the piece a solid color. It may also be made with colored warp threads, but on account of the scarcity of warp threads less effective results are obtained than are obtained in the first two grades.

A typical sample is herewith enclosed, but is a little better quality than the particulars given refer to.

These cloths are generally made by manufacturers who make up their own cloths into hammocks and sell in this form.

They require no finishing, as they are made up into hammocks in the condition as taken from the looms, except in cases where the goods are to be dyed.

DRAPERY FOR HAMMOCKS.

In making hammocks, hangings or draperies are employed and these cloths are closely related to the hammock cloth. They are made on the same looms as hammock cloths and are of the same texture.

The yarn used is the same generally, but the cloth need not be as strong as the body cloth. The ends and picks per 1 in. may be a little lower. The drapery cloths are made two in a width, there being 12 in. or 14 in. of the reed empty between the two cloths. The filling is thrown across in the regular manner, and when the cloth is woven, the filling is cut in the centre of space between the cloths and the ends thus formed constitute the fringe of the hangings, which fringe is knotted in various ways to make the hanging more effective.

In order to secure the warp threads at the inside edge of drapery while weaving, the two ends nearest the fringe side are made to cross each other in weaving and make a firm selvage for the actual cloth.

The warp yarn may be either in colored stripe form or solid color, and the filling solid color, or both warp and filling may be in undyed state and dyed in the piece when woven.

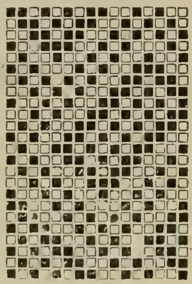
The draperies are made to match the body, similar colorings and designs being employed.

WEAVES TO EMPLOY.

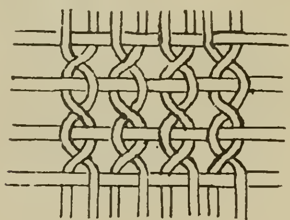
The best qualities have generally

jacquard effects, and as the texture is not so compact, the plain weave must be used extensively in ground, the figure being either 5 harness satin or 3—1 twill.

The medium qualities as made on harness looms have weaves of the following character, the plain weave being conspicuous in order to make a firm cloth:



Low grade cloths are made almost exclusively with the gauze weave, the following being a typical one:



MADRAS.

Madras is a light-weight cotton cloth, composed of all cotton or cotton and silk, and is a single cloth fabric, having excellent wearing qualities.

It has been on the market for many years and is considered a staple in the cotton goods line. It is a narrow fabric sold at 27 inches width, and is made of varying grades, weighing from two ounces to three ounces per yard, and is used at all seasons of the year. It is used by the ladies for summer skirts, shirtwait suits, etc.; by men for shirts, shirt bosoms, and four-in-hand and bow neckties. It is also used as a drapery in workmen's homes for windows, etc.

It is known by the plain white ground and fancy colored narrow stripe warp effects and is made of cotton yarns ranging from 1-26s to 1-80s warp and filling, and from 50 to 100 or more ends per inch. The knowledge of the utility of madras being common among most all classes of people, permits of the greatest scope in creating both harmonious and contrasting color and weave combinations, simplicity in color arrangement being generally the keynote to success in producing an elegant, good-selling line.

COLORS.

Those colors most in demand, which have been adapted to this fabric, are rich and delicate shades of blue, rose, green, linen, tan, lavender, ecru and bright red.

For prominent hair line effects use black, navy blue, dark green, royal blue and cherry red. Good fast color is necessary in making madras as it is a wash fabric, the feature of which is the fine colored stripe effect running warp ways.

If inferior colors are used, they will surely spread during the finishing process, and will cause a clouded stripe where a distinct one was intended, thereby causing a pile of seconds. Madras used in making men's stiff bosom shirts, which retail at $1.50 and upward, in most cases is made entirely with a plain weave.

Sometimes the colored stripe is developed by doubling up in the heddle and reed (by drawing in two or more ends in one heddle, and the threads of several heddles in one split in the reed).

ANOTHER METHOD.

Another method is to weave the colored warp threads on other harnesses than those of the body of the cloth, using a twill weave on these harnesses, and by doing so create a perfect cord in the cloth.

High-grade patterns are usually formed by making a plain white stripe from ½ inch to 1½ inches in width, and the colored stripe of 2, 4, 6, 8 ends. In using any of these numbers of ends, the width of the colored stripe is governed by the fineness of reed, and method of drawing through the reed, consistent with the weave effect desired.

Madras is usually made on either the old roller loom, or the more modern dobby loom.

Fancy madras is made more successfully on the dobby loom, 20-harness capacity covering most all combinations used in this line.

A good grade of madras is made by using 1-30s cotton warp and filling.

1.200 reed, two ends per dent: 31½

inches in reed; 56 picks, 1-30s filling; finish, 27 inches; weight, 2¾ ounces.

WARP PATTERN.

14	White 1-30s	Plain weave.
1	White 2-40s	
14	White 1-30s	
4	Rose 1-30s	Basket weave.
10	White 1-30s	Plain weave.
4	Green 1-30s	Basket weave.
47		

Finish for madras: Run through washer, cylinder (to dry cloth), tentering machine, calender or press.

Finishing Particulars.

Starch, 6 ounces cornstarch, 2 ounces white cocoanut oil softening, 1 gallon water. Calender with light calender machine.

GINGHAM (Common.)

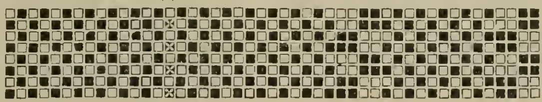
Gingham (common) is a single cloth composed entirely of cotton and always woven with a plain weave; it is the most universally known fabric on the market and is made in various grades, having from 50 to 76 ends per inch in the reed and of 1-26s to 1-40s cotton yarns in both warp and filling. It is a wash fabric, made in both check and plaid patterns, into which an almost unlimited variety of color combinations are introduced. It is most commonly used in the manufacture of ladies' and children's aprons and summer outing dresses.

It can be woven in any power loom having a box motion attached but is

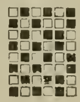
1 end 2-40 cord.

Design.

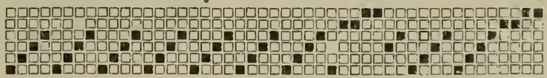
One repeat.



Harness Chain.



Drawing-in Draft.



Reed Plan.

Note.—Design is two repeats in filling, and is intended to show connection between first and second repeat.

Dyeing Particulars for Madras.

Following are dyeing particulars for good madras shades:

LIGHT GREEN.

Mordant yarn with 2 per cent tannic acid. Give 5 turns and fix with 2 per cent tartar emetic. Wash well. Dye 1 per cent new methylene blue G G, ½ per cent thioflavine T. Wash well.

PINK.

Mordant yarn with 2 per cent tannic acid. Give 5 turns and fix with 2 per cent tartar emetic. Wash well. Dye 9 ounces acridine red 6 B, 3 ounces rhodamine 3 G. C. Bischoff & Co. Wash well.

most successfully made in Fairmount, Bridesburg, Mutual Mason 4x1, Crompton 6x1 gingham loom, or 4x1 box, roller loom, using four harness or heddle shafts, and having as a selvage eight double ends on each side.

Gingham warps are made in two lengths, 720 yards and 1,080 yards, and these lengths being subdivided into shorter lengths or cuts, usually 14 and 21, respectively.

When a gingham warp is woven out the set of harnesses or heddles, it is taken out of the loom, and is placed in a twisting frame and twisted, an operation which means the fastening together, by means of the fingers, of those ends remaining in the set of harness, and those of the new warp. A practised

operator can accomplish this work at the rate of 50 to60 ends per minute, and he is generally a boy of perhaps 16 years of age.

Loom fixers each have a section of looms numbering 60, to care for and keep in good running order.

FINISHING GINGHAMS.

The goods are taken from the loom and conveyed to the wareroom,and the ends of several pieces or cuts are sewn (chain stitch) together on a sewing machine, thus making a continuous length of cloth of several hundred yards, about 300 yards. (This is done to facilitate handling.)

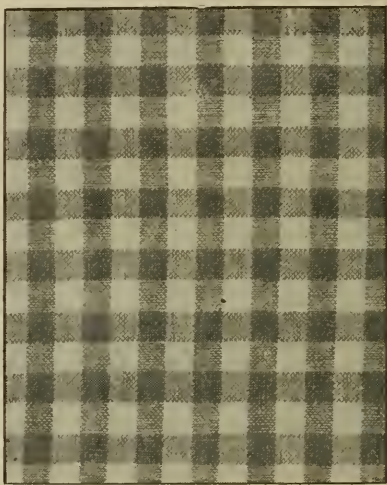
It is now run through the sprinkler, the object of which is to dampen the cloth in such a manner as to improve its receptive qualities in the sizing operation.

The sprinkler is a machine having a box arranged on its top. Through this box is passed a roller having bristles set on end at regular intervals, similar to the brush in a carpet sweeper; the box is fed with water by means of a small pipe, and the cloth on entering the machine passes over the roller brush, which in revolving comes in contact with the water, and spreads it over the cloth, which is drawn through the machine by means of delivery rollers at the opposite end.

From the sprinkler, it goes to the size tubs, where it is given a good amount of starch sizing. It is next run through the cylinders to dry it, and then run through the tentering machine, which operation is a continuing of the drying process, also stretching the cloth in width. It is then passed through the calender, which is a sort of hot press, and in which operation it is smoothed, and receives the desired glaze on the face of the cloth. From the calender the cloth goes to the lapping machine, where it is rolled around a small wooden board,known as a lapboard, the operator making a bolt of each cut of cloth, the length of which is governed by the subdivision of warp.

After the lapping operation, the cloth, which is now in the shape of a bolt (commercial term), is taken by the folder, who unravels a couple of yards and doubles it up, and neatly rolls it back in place, while he tucks in the ends. The bolt is then stitched with a strong cord, twice through each end; the ends are then singed with a gas flame to remove odd scraps of filling threads. The bolts of cloth are then placed in a plate press in the following order: three or four bolts are laid flat side by side in the press, and a zinc or other metal plate placed upon them. This is repeated until the press is filled with desired number of pieces or bolts, the top of the press is then run down by means of a belt connecting with a driving shaft, and the goods allowed to remain in this condition several hours, after which the paper bands are placed around them and they are ready for shipment. The following is a list of standard gingham patterns, known as two shuttle checks and usually made in blue, brown, green, black, red, colors.

Warp and filling: 2-2, 4-4, 6-6, 8-8, 10-



Gingham.

10, 12-12, 14-14, 16-16, 18-18, 20-20, 24-24, the pattern reading:

2 Blue / 2 White or 24 Blue / 24 White } Warp and filling.

For side pattern effects use same colors:

4—2, 8—4, 6—4, 10—6, 20—10.

10—6—2—6

8—4—2—4

6—4—2—4

Read in this manner:

10 Blue
6 White
2 Blue
6 White
} Warp and filling.

Staple ginghams are known to the mill man as 900, 1,200, 1,400, meaning 900 reed, 1,200 reed, 1,400 reed. Those made with a 1,400 reed are usually intended as an imitation of zephyr ginghams.

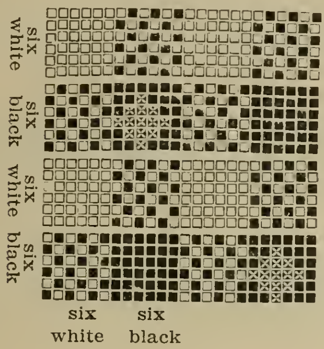
A good grade of ginghams can be made thus: reed, 900—two ends per dent; 29 inches in width; 44 picks fill-

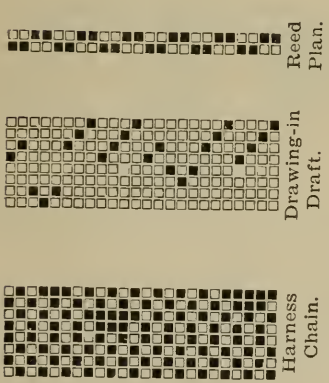
ing. Finish, 27 inches. Check pattern. Weight about 2.1 ounces; 1-26s cotton warp and filling. Plain weave.

A better grade thus: reed, 1,200—two ends per dent; 29 inches in width; 52 picks filling. Finish, 27 inches; weight 2¼ ounces; 1-30s cotton warp and filling; generally stripe patterns; plain weave.

A fine grade thus: reed, 1,400—two ends per dent; 29 inches in width; 60 picks filling. Finish,27 inches; weight

Design.





Design represents weave and color effects in spotted check gingham.

two ounces; 1-40s cotton warp and filling. Check or plaid pattern, plain weave.

Ginghams are made with from two colors, warp and filling, to eight colors in warp and six in filling.

The 1,200 grade is occasionally made up in spotted check effect or say six black, six white, having a small diamond-shaped figure at regular intervals, produced in dobby looms.

Another style, having great vogue some 10 years ago is known as apron ginghams, made in 900 grade, and having about three-quarters of the width of the cloth woven in a small check, 4x4, and the remainder having a large pattern, with a woven check in the filling. It is usually made in two colors, and made 36 inches in reed.

Reed 900—two ends per dent; 36 inches in reed; 44 picks filling. Finish 34 inches; 1-26s warp and filling. Plain weave.

Warp pattern.
4 Blue, 1 White } 168½ times = 1348 ends.

Filling pattern.
4 White
4 Blue

8 Blue
2 White
6 Blue
10 White
10 Blue
22 White
10 Blue
10 White
6 Blue
2 White
52 Blue
2 White
4 Blue
10 White
2 Blue
16 White
2 Blue
10 White
4 Blue
2 White
40 Blue

Read from top to bottom then reverse.

222 ends x 2 = 444 ends in border.
1348 in ground.

1792 + 8 ends blue.

Blue for Ginghams.

Following are the dyeing particulars of a good blue for a gingham (common).

For 100 pounds yarn, 1st bath: 6 pounds immedial indone 3B cone; 12 pounds sodium sulphide crystals; 4 pounds grape sugar (glucose); 3 pounds soda ash; 4 pounds common salt.

For standing bath; 3 pounds immedial indone 3B cone; 6 pounds sodium sulphide crystals; 1½ pounds glucose, ¾ pound soda ash.

Immedial indone 3B cone is one of the Cassella Color Co.'s colors. Should a bluer shade be required, a little immedial indone B cone can be added. If a greener shade is needed, a little immedial yellow D can be added.

Dye for one hour, turning the goods several times, then squeeze off well by means of the squeezing rollers attached to one end of the vat, and level by wringing off rapidly at the wringing post.

Then age the yarn three-quarters of an hour, rinse well and soap if required. Uniform and careful squeezing and wringing off are essential to ensure good levelness of the dyeings.

Immedial indone 3B cone and B cone are excellently suited for the production of every shade of indigo, both for light shades when dyed by themselves, and for medium and darker shades when dyed in combination with immedial direct blue, or the other brands

of immedial indone. By reason of their simple method of application they deserve the special attention of all branches of cotton dyeing.

FINISHING FOR GINGHAMS.

Starch: 2-8 ounces cornstarch; 4-8 ounces white softening; 1 gallon water; mix cold, boil half an hour.

White softening is from cocoanut oil. Pieces are run through a starch mangle and on to a cylinder drying machine. They are then damped on a sprinkler machine and given a light calendering.

CRASH.

Crash is a single cloth fabric, composed of all-cotton yarns, or of cotton and jute. It is used principally for toweling and as a covering for fine carpets. In some of the southern states it is made with a plain weave, and worn as a summer men's wear fabric, as it is cheaper than linen.

It is usually made of 1-14s, 1-16s, 1-20s cotton warp and filling, and sometimes of 1-10s and 1-12s cotton. As a carpet covering, it is woven in a narrow loom, and has either broad or narrow stripes in the warp, of fancy colored dyed yarns, dark red and dark blue being common colors. The ground of the cloth is made of cotton yarns in the gray, or unbleached state. This fabric has the

APPEARANCE OF LINEN,

due to the heavy sizing, and calendering in finishing. Small warp effect twill weaves are used, such as 2—1, either right or left hand, and running at 45 degrees. 1-16s cotton warp and filling crash toweling is made of yarns both in the gray and bleached state, generally about 1-14s cotton warp and filling, in widths varying from 15 inches to 24 inches finished, either all bleached or with side and cross borders, or in what is known as

HAIR-LINE PLAIDS.

Rarely any colors, excepting red or navy blue, are used in toweling.

THE SAME WEAVES

are used in this line as in ordinary linens, namely, the plain weave or 1 up and 1 down, in the commoner grades. But for bathing purposes, where a rough toweling is sometimes required, there is the bird's-eye or huckaback weave—also the eight-end honeycomb weave. Toweling, having as a design floral or scroll figures, is made on narrow looms, having a jacquard machine attached; this sort is used for bureau scarfs.

Crash can be

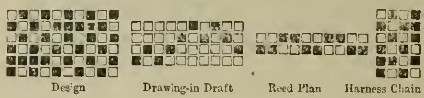
WOVEN ON ANY POWER LOOM.

The kind of loom necessary to produce any certain grade of crash is governed by the construction of weave effect desired, as, for instance, either the plain weave or twill weave effects are best adapted to the roller or cam loom; the more complicated fancy weaves, such as huckaback and honeycomb, necessitate the use of a dobby loom.

TO FINISH CRASH,

it is first run through a sprinkler, to dampen it; then it is put through the size tub and rather heavily sized, after which it is run through a dryer. From the dryer it goes to the calen-

HUCKABACK DESIGN.



HONEYCOMB DESIGN.

ders, in which machine the gas-heated top roller acts upon the sizing and produces the rather glazed effect on the face of the cloth.

Crash toweling using huckaback weave: reed 850, 2 ends per dent; 18 inches wide; 1-16s cotton warp and filling (bleach); 46 picks of filling; finish 16½ inches; weight, 1.85 ounces.

To make a softer feel, use one-half number of picks and wind 1-16s and 1-20s (1 end of each) on same bobbin, and weave it in; this also increases the mottled effect.

Crash toweling using honeycomb weave; reed 850, 2 ends per dent; 20 inches wide; 2-20s cotton warp and filling (bleach); 44 picks of filling; loom width, 16 ounces; no finish; weight, 3¼ ounces. Use dobby loom for each of these fabrics.

In making honeycomb toweling, if using a cross border, the Crompton double cylinder or two-weave dobby is the most convenient, as the border weave and the body weave each has

its separate harness chain, and is worked from the box chain.

THE FINISHING.

Detailed Description of the Process of Crash Finishing.

To finish a piece of crash ready for the market: If the piece is clean enough and a cheap rough finish is required, the first process is starching. A very light starch liquor is necessary, to one gallon of water, two to six ounces of cornstarch, one-half to one pound cocoanut oil softening. Mix in cold water and boil together for 30 minutes. The pieces are passed through a starch mangle at full width, over a drying machine of steam cylinders. They are then passed through a light calender to straighten the goods out, and smoothed down a little. They are then folded up, packed in cases and shipped away.

The goods can be bleached, each piece being placed separately in a kier, or the ends sewed together and the goods run into a kier, with a 4 degree Tw. solution of caustic soda, and boiled six to eight hours.

The goods are then run through

A WASHING MACHINE

and returned to the kier, and the soda boil repeated for eight hours. The goods are run through a washing machine, and through a solution of oil of vitriol ½ degree Tw., washed again, and run through a solution of chloride of lime at ½ degree Tw., piled in a bin for eight hours, run through an acid solution of oil of vitriol ½ degree Tw., and well washed till all trace of acid is eliminated. If any acid is left in the goods, the goods, being very heavy, will be tender, as they will retain so much acid when dried on the drying machine, they will have the fibre of the cloth injured. The goods are then starched with four to six ounces to a gallon of cornstarch, one-half pound cocoanut oil, white softening. This is to add a little fullness to the cloth without making it too stiff and starchy. The goods are then dried on a tenter frame at full width, to keep them straight and have the weft perfectly straight across the piece.

If required, they are then given a light calendering. If a light buff or ecru is required, a little color is added to the starch liquor, or the goods are dyed on a jigger machine, or on a padding machine.

These goods will stand a great amount of wearing, and look dressy and chic, without being too expensive.

DOMET OR OUTING CLOTH.

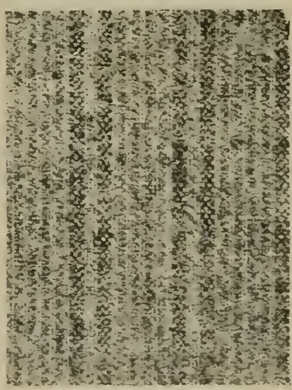
Domet, or outing cloth, is a single cloth, composed of single cotton yarns, generally 1-20 to 1-26 warp yarn, and 1-14s or 1-16s cotton or cotton and cotton shoddy mixed filling yarns. It is made in bright colored stripe and plaid patterns, and is used in the manufacture of shirts, pajamas, etc., and is always woven with a plain weave, or 1 up, 1 down.

In effect it is a fabric having

A SOFT, REGULAR NAP

on both sides of the goods and in appearance is very similar to a flannel.

The nap is produced by carding or



Domet.

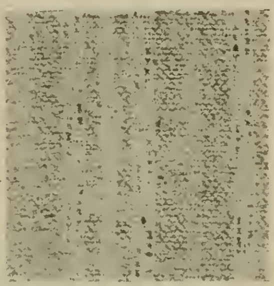
brushing up the loose outside fibres on a rather slack twisted filling yarn, by running the cloth through a napping machine.

The napper is a machine consisting of a series of wooden rollers, through which the cloth passes, as the machine is working, automatically. The brush roller, that part of the machine which raises the nap, is a wooden cylinder covered with wire card clothing, and is in fact the same as a fancy on a woolen card. This brush roller is set on the top of the machine near the centre, and is so arranged that the cloth passes between it and a wooden or other solid roller or cylinder, and as the brush roller revolves, the wire teeth in the card clothing come in contact with the surface of the cloth and as they are running in opposite directions, the filling being the softest, the natural result is a nap being raised.

A domet fabric may have either a high or long nap, or a short or close nap.

THE DEGREE OF NAP

to be produced is governed first by the experienced judgment of the manufacturer in buying a filling yarn which will produce the best results, namely, a fine nap, with minimum loss of strength as a thread, as a knowledge of the amount of filling twist and in a



Domet.

given count, less the percentage of twist, to create proper degree of slackness in the yarn, is found convenient when buying this kind of yarn.

Domet is made on a roller or cam loom, and as a cloth receives

NO FINISH, EXCEPTING THE NAP.

The selling width of the cloth is about 29½ inches. During the process of napping, a domet loses a small percentage of the filling weight. This waste is called fly, as it is used by shoddy manufacturers in the production of heavy backing yarns.

Warp colors used in domet stripes: dark blue, light blue, light brown, pink and light green.

Filling: all white for stripes, and in some grades, cotton and cotton shoddy mixed yarns give the fabric a dark tone, after the napping. The last-named grade is used extensively as a working shirt for machinists, as it doesn't show the soiled places very readily, and will tear easily if caught in the machinery.

Warp stripe domet: reed 800; 2 ends per dent, 31½ inches, 1-22s cotton warp yarns, 36 picks.

1-16s cotton filling, 11 turns twist (will produce good, close nap).

Selling width, 29½ inches.

Plain weave on four harness; drawn-in, 1, 2, 3, 4.

Weight, 2.3 ounces, about.

Amount of filling twist, less about 15 per cent, will give good results in napping.

Filling loses about ¼ per cent of its weight during napping process.

Design Drawing-in Draft Reed Plan

Carding Particulars.

The raw stock used for these goods should be American of about 1⅜ inch staple. The usual plan of mixing the cotton is followed of having the mixings as large as possible, but no other special attention need be given to it. At the pickers the only special feature to look out for is

THE SPEED OF THE BEATER.

This should be run at above the average speed because the cotton used generally contains more than the average amount of dirt, etc., found in cotton. The weight of the lap at the front of the finisher picker should be heavy. At the card the only special features to be careful of are the settings. These should be open because of the weight of the lap put in at the card and also because the production of this machine with this class of goods is large. The most special attention given to this class of goods is at

THE DRAWING FRAME,

three processes being the usual number run. The most important points to look out for are as follows: that the settings are all right, the top leather rolls are properly covered, and that they have no channels or are not hollowed out along their entire length, that the top rolls are kept properly varnished, that the stop motions are properly adjusted, and lastly, that the condensing or large front calender rolls are set so that the proper pressure is brought to bear on the cotton sliver being passed between them. It may be just as well to say

A FEW THINGS

here about the drawing frame which apply not only to the class of cloth under description, but also to all cotton yarns for all classes of work. Too little attention is given to the drawing frame. Just because it is one of the most simply constructed machines used in the card room, it generally receives the least attention. This should not be the case, however, because the drawing frame, unless properly looked

after, will make a great deal of difference to the appearance of the yarn made. If the drawing frame is properly looked after it will be found that the roving being made will be a great deal evener than if the drawing frames are left to look after themselves. Particular attention should always be given to the

DIFFERENT STOP MOTIONS

to see that they are doing what is required of them. It will be seen that if only one stop motion in a head does not work properly and allows an end to pass through the machine without stopping it, the resulting finished yarn is going to be lighter at that certain part and in this way make an uneven yarn. I know that it will be said that the drafts and doublings at the future machines

WILL HELP TO OVERCOME

this defect, but if the adjustment were made at the drawing frame this particular defect would not exist. Perhaps a good thing for card-room overseers to paste in their hats would be, "Watch your drawing frames, first, last and always." We have wandered somewhat from the subject under description and will conclude the carding end of it by saying that no special points, outside of the ones generally followed, need be given to the making of the roving. A great deal of the unevenness of the yarn, if any exists, is covered up because the cloth is napped.

Dyeing Particulars.

The colors in the fabric illustrated can be dyed in the yarn or raw stock. The dyeing particulars are as follows:

GRAY.

For 100 pounds of raw stock for dark gray, Cassella Color Co.:

1st bath: 15 pounds immedial black N. G.; 4 ounces immedial yellow D.; 10 pounds sodium sulphide; 7 pounds soda ash; 12 pounds cryst. Glauber's salt.

2d and standing bath: 7 pounds immedial black N. G.; 1 ounce immedial yellow D.; 5 pounds sodium sulphide; 3 pounds soda ash; 4 pounds cryst. Glauber's salt.

Enter stock, raw cotton, at the boil, and keep at 200 degrees F. for one hour.

Wash well with water and squeeze through rollers, and repeat operation of washing several times, till cotton is perfectly clean.

FOR LIGHT GRAY.

1st bath: 8 pounds immedial black N G, Cassella Color Co.; 3 ounces immedial yellow D, Cassella Color Co.; 8 pounds sodium sulphide; 6 pounds soda ash; 10 pounds cryst. Glauber's salt.

2d and standing bath: 5 pounds immedial black N G; 2 ounces immedial yellow D; 5 pounds sodium sulphide; 4 pounds soda ash; 5 pounds cryst. Glauber's salt.

Enter stock at boil, and keep at 200 degrees F. for one hour.

Wash well, as with darker shade. The immedial colors of the Cassella Color Co. are absolutely fast to washing and sunlight, and are free from sulphur, so that there is not the danger of tendering the fibre as with so many of the sulphur colors.

The immedial colors are gradually replacing the direct one-dip colors which have had so long a run, and which were used so extensively for the last 10 years or more.

The immedial colors are now made into blacks, blues, browns, yellows, greens, wines, and very soon there will be a full range of shades made, to match all colors required in cotton goods. The immedial blues are as fast as the indigo shades so long used for all fast colors.

PINK.

For 100 pounds raw stock, cotton: 20 pounds Glauber's salt; 2 pounds sal soda; 5 ounces diamine rose G D.

Enter at boil and boil one hour. Wash well in water.

BLUE.

For 100 pounds raw stock, cotton: 20 pounds Glauber's salt; 2 pounds sal soda; 1½ pounds diamine blue B X.

Enter at boil and boil one hour. Wash well in water. The diamine rose G D and the diamine blue B X are from the Cassella Color Co. and are very level dyeing colors and very fast to light and washing.

A variety of colors, of course, can be used in the dyeing of this fabric.

ZEPHYR GINGHAM.

Zephyr gingham is the finest grade of gingham made, and is a light-weight cotton fabric, composed of 1-40s to 1-60s cotton warp and filling yarns.

It is woven with either the plain weave or a small all-over dobby effect. It is made in very attractive patterns by using good fast colors in warp and

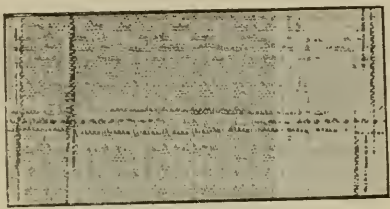
filling, and, as a cloth, has splendid wearing qualities.

From

TWO TO TEN COLORS

can be used in both warp and filling, the filling colors being governed by the number of shuttles the loom will run, and this number is increased by the introduction of fancy colored, printed yarns.

Zephyr gingham is made up into

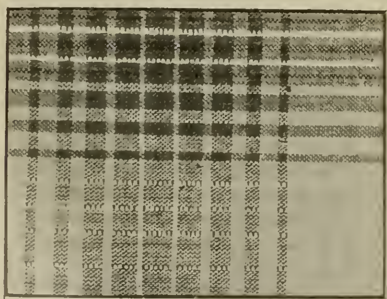


Zephyr gingham.

such patterns as light and dark tone, shaded plaids, corded and ribbed stripes, small checks and broad, delicately colored plaids, having a random printed yarn coloring, and this last combination is woven on a dobby loom, using as a design a small broken twill arrangement. The effect produced is something on the order of a jacquard pattern.

MIXED COLOR EFFECTS

are made by dressing the warp, one end white, one end fancy print, for,

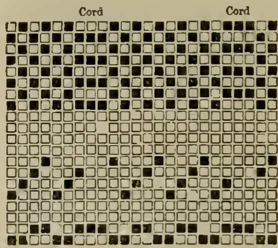


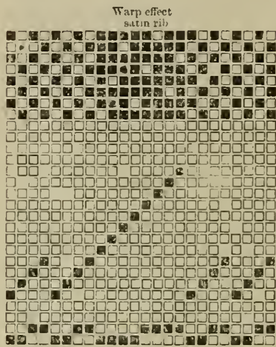
Zephyr gingham.

say, 100 ends, and then making a rib by using a satin weave for eight or ten ends of a dark color, such as black, blue or red brown. This style is made in stripes, as stated above, also in plaids by using all white filling to cross the one and one dressing in the warp and a correspondingly dark colored filling squared with the satin rib in the warp.

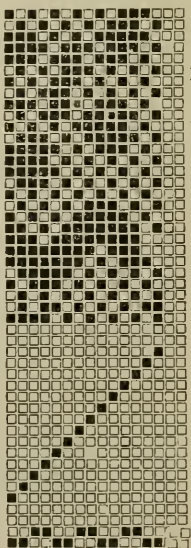
CORDED EFFECTS

are produced by drawing in 2, 3, 4. ends in one heddle and split, and this is





Fancy Dobby Weave Zephyr.



squared in the filling by using a correspondingly heavy thread, as, for instance, 3 ends 1-40s warp in one heddle and 1 pick of 3-40s in filling. This

would require such a loom as the Knowles 4x4 box dobby loom.

For a roller loom, using plain weave, and making a cord, draw warp in, as stated above, or make two cords side by side by drawing in two ends per heddle and four ends in split, and square this by two picks, each of 1-20s cotton filling.

Zephyr gingham can be woven on any roller loom. Of this style loom the 4x1 box is the more suitable. For more elaborate filling patterns there is the Crompton 6x1 box gingham loom, and for fancy weave effect take a loom having a spring bottom dobby motion attached.

COLORS FOR ZEPHYR.

Black, light blue, dark blue, light brown, pink, red, tan, ecru, canary, orange, new blue, old gold. Print yarns can be obtained of almost any color desired.

A good grade of zephyr gingham is made as follows:

Reed 1,500, two ends per split, 29 inches wide, 80 picks; weight, two ounces about; 1-50s cotton warp and filling; finish 27 inches.

COLOR EFFECT.

Warp pattern.

4 Brown.
4 Blue.
8 Brown.
6 Blue.
6 Brown.
8 Blue.
4 Brown.
8 Blue
1 White cord equals 3 ends.
8 Blue.
2 White.
1 White cord equals 3 ends.
2 White.
4 Blue.
4 White.
1 White cord equals 3 ends.
4 White.
2 Blue.
8 White.
1 White Cord equals 3 ends.
8 White.
2 Blue.
4 White.
1 White cord equals 3 ends.
4 White.
4 Blue.
2 White.
1 White cord equals 3 ends.
2 White.
8 Blue.
1 White cord equals 3 ends.
8 Blue.
4 Brown.
8 Blue.

SHADED PLAID.

Filling same as warp pattern.

Pattern continued.

6 Brown.
6 Blue.
8 Brown.
4 Blue.
4 Brown.
2 Black.
4 Brown.
1 White cord equals 3 ends.
4 Brown.
4 Black.
4 Brown.
1 White cord equals 3 ends.
4 Brown.
2 Black.

The finish consists of sprinkling and of running cloth through very thin sizing, after which it is tentered and calendered.

Carding Particulars.

Various grades of cotton as well as different lengths of staple are used for the class of goods described. The length of staple used for the former goods is about 1½ inches and generally American cotton is used. The mixings should be as large as possible so as to obtain an even yarn. It will be at once seen that if small mixings are used there will be some little difference in each mixing and just this little difference will show up in the finished yarn. This applies not only to this mixing for the class of goods described but to all mixings for all goods, and

THE MIXING

of cotton is one of the most particular points of carding, because if different lengths of staple are allowed to be mixed together, it is bound to cause trouble in addition to uneven yarn. Every bale of cotton should be separately stapled before it is allowed to be put into the mixing, and if the staple is longer or shorter than the cotton already mixed, it should be put one side.

The cotton should be run through openers and two processes of pickers, although a great many mills use three processes; but all the newer plants being built have only two processes of pickers. The

SPEED OF THE BEATER

should be about 1,050 revolutions per minute for the opener and 1,500 revolutions per minute for the breaker and 1,450 revolutions per minute for the finisher, a 12 to 13 ounce lap being made at the finisher picker.

The card should have closer settings than for the cloth described last week. Special attention should be given to the setting of the back plate to the licker-in. If this plate is set too close the cotton will be broken and if set too far away will cause bunches to come through. It is always just as well, when setting a card for new length of stock or changing over, to sample the cotton, both before it enters the card and after it leaves it, to compare the two staples and to see if they are of the same length. A good weight per yard for sliver at the card for this class of goods is 50 grains. On the former grades of the goods under description

THE COTTON IS COMBED.

This, of course, means extra expense because of the extra machines used, but it also makes the yarn evener because at the comber all the short fibres are taken out, leaving all the fibres of the same length. When combers are used only two processes of drawing are regarded, but when the combers are not used for this class of goods then three processes of drawing are used. For this class of goods only 15 per cent waste should be taken out at the comber.

At the speeders or fly frames the drawing sliver is put through the slubber, 1st intermediate, 2d intermediate and fine frames, the finished hank roving ranging from 8 to 12 hank. In the samples under description the hank used would be about 12. Watch the settings of the rolls at the fly frames and see that all your frames are set alike. These settings should be looked after all the time and should lapping or bunching occur it is a pretty good indication that something is wrong with your roll settings. If many frames are being run on the same stock,

IT IS VERY IMPORTANT

to have all the change gears the same, especially the draft gear. It sometimes happens that the wrong draft gear will be put on one frame and the result is that the yarn is delivered to the ring spinning room or mule room uneven. It will also cause a great deal of trouble in sizing the yarns. This trouble is greater if the wrong gear is put on one of the 2d intermediate frames because the draft gear on these machines is seldom changed and you might not look here for the trouble for a long time and until considerable annoyance had been caused.

Dyeing Particulars.

The colors in the fabric illustrated are dyed in the yarn. The dyeing particulars are as follows:

LIGHT TAN.

For 100 pounds yarn: 12 ounces immedial yellow D pat.; 2 ounces immedial olive B, pat.; 7 ounces immedial cutch G, pat.; 5 pounds sodium sulphide; 10 pounds cryst. Glauber's salt; 3 pounds soda ash. Enter yarn at boil and boil one hour. Wash well with two or three waters.

ECRU.

For 100 pounds yarn: 6 ounces immedial yellow D, pat.; 1 ounce immedial olive B, pat.; 4 ounces immedial cutch G, pat.; 5 pounds sodium sulphide; 10 pounds cryst. Glauber's salt; 3 pounds soda ash. Enter yarn at boil. Boil one hour. Wash well with two or three clean waters.

LIGHT BROWN.

For 100 pounds yarn: 8 ounces immedial brown B, pat.; 1 pound 4 ounces immedial cutch O, pat.; 5 pounds sodium sulphide; 10 pounds cryst. Glauber's salt; 3 pounds soda ash. Enter yarn at boil, and boil one hour. Wash well with two or three waters.

OLD GOLD.

For 100 pounds yarn: 2 per cent immedial yellow D, pat.; 6 per cent sodium sulphide; 12 per cent cryst. Glauber's salt; 3 per cent soda ash. Enter yarn at boil. Boil one hour. Wash well with two or three waters.

PINK.

For 100 pounds yarn: 6 ounces diamine rose G D, pat.; 2 pounds sal soda; 25 pounds Glauber's salt. Enter at boil. Boil one hour. Wash well in water.

NEW BLUE.

For 100 pounds yarn: 3 per cent immedial sky blue powdered conc.; 5 per cent sodium sulphide; 10 per cent cryst. Glauber's salt; 3 per cent soda ash. After treated with ½ per cent bichrome potash; ½ per cent bluestone. Wash well with water.

LIGHT BLUE.

For 100 pounds yarn: 1½ per cent immedial indone B, pat.; 1½ per cent immedial sky blue powdered conc.; 5 pounds sodium sulphide; 10 pounds cryst. Glauber's salt; 3 pounds soda ash. Enter at boil. Boil one hour. Wash well with water.

DARK BLUE.

For 100 pounds yarn: 5 pounds immedial indone blue, 3 B, pat.; 10

pounds sodium sulphide; 15 pounds cryst. Glauber's salt; 5 pounds soda ash. Enter at boil. Boil one hour. Wash well with water.

ORANGE.

For 100 pounds yarn: 5 pounds immedial orange C, pat.; 8 pounds sodium sulphide; 15 pounds cryst. Glauber's salt; 5 pounds soda ash. Enter at boil. Boil one hour. Wash well in two or three waters.

BLACK.

For 100 pounds yarn, 1st bath: 20 pounds immedial black N N conc; 12 pounds sodium sulphide; 20 pounds cryst. Glauber's salt; 5 pounds soda ash.

2d bath: 10 pounds immedial black N N conc.; 8 pounds sodium sulphide; 15 pounds cryst. Glauber's salt; 4 pounds soda ash.

Enter at boil. Boil one hour. Wash well in two or three clean waters.

The Finishing.

In the finishing process use: 4 to 8 ounces cornstarch, 4 to 8 ounces cocoanut oil, white softening, 1 gallon water. Mix cold, boil half an hour. Starch through mangle. Run over drying cylinders. Sprinkle, and calender through light calender. After starching, the goods are sometimes dried over the tenter frame to keep the pattern straight across the piece.

CRINOLINE.

Crinoline is a fabric composed of cotton warp, horsehair filling or all cotton yarns. It is sold in varying widths, and is used by tailors and dressmakers in stiffening clothing.

It is a cheap cloth of low texture and simple construction,

THE DISTINGUISHING FEATURE.

being the stiff finish with either a dull or highly glazed face on the cloth. Crinoline, having a horsehair filling, requires a loom of special construction to handle the hair, as it is hung in a neat bundle on the end of the loom, the hair being of a uniform length and color, generally black; the mechanism on the loom drawing a strand of hair from the bunch and placing it in the shed formed by the harness. A herring-bone twill weave is used in this grade of the cloth. Practically

THE SAME EFFECT

can be produced by using a glazed warp thread and a cotton filling. The glazing process is to take the cotton warp thread, and after charging heavily with a solution of sizing, the yarns are run through super-heated cylinders and rollers, the

Crinoline.

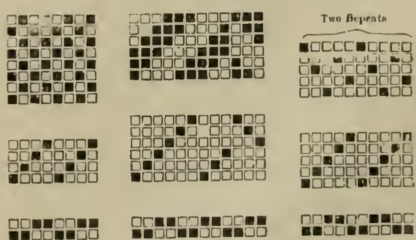
effect being a highly polished surface to the yarn.

Crinoline composed of regular cotton yarns is stiffened by weighting the fabric with sizing; the weight of the size, in some cases, equals 20 per cent of that of the yarns used in construction.

Crinoline is made generally on the roller or cam loom of 1-20s to 1-26s cotton warp and filling yarn, using 25 to 40 ends and picks per inch, the cloth losing about 10 per cent of its width from loom to finished width. The warps are sized 6 to 10 per cent and the woven cloth made to absorb 15 to 20 per cent of its weight, during sizing operation.

TO FINISH CRINOLINE

means to stiffen it. The cloth is



No. 1. No. 2. No. 3.

1. Crinoline. Plain Weave.
2. Crinoline. Herring-bone Weave.
3. Haircloth; 5 harness satin filling effect.

therefore taken direct from the loom to the size tubs, and after this operation it is run through the cylinders to dry it, after which the glaze finish is produced by the action of the heat-

ed rollers in the calender machine. The cloth is then rolled or lapped, to whatever size bolt desired, the bolted pressed in plate press, and the crinoline is ready for the packing cases.

Crinoline is usually made in either solid black or cotton in the gray.

CRINOLINE.

Plain weave; reed 700; 1 end per split; 27½ inches reed; 1-26s cotton warp and filling; 36 picks; 20 per cent size in finish.

Color, black; weight, 1.9 ounces; 16 square inches, weight 15.1 grains, finished weight; 16 square inches, weight 12.1 grains after sizing is removed.

Horsehair is used in manufacturing haircloth, a fabric used for furniture covering, the weave being a filling effect satin (generally about five harness), to throw hair on the face of the cloth. These satin weaves permit of about 15 per cent more ends and picks than are used in an ordinary weave. This is due to the long floats in either warp or filling effect satins.

Carding and Spinning Particulars.

Although the yarns used to make crinoline are what are called coarse yarns it must not be thought that they may be neglected in any way in the carding and spinning, because coarse yarns should not be thrown together any more than the finer counts of yarns. We should not turn our attention from the carding and spinning of coarse yarns and let them be run through the different machines until the required count is made, but we should give special attention to the production end of these yarns as it is here we can make the best showing. In coarse counts of yarns it should be our aim to get as large a production from each machine as possible and

NOT OVERLOAD THE MACHINE,

and at the same time produce as good a finished yarn as possible. Another thing, when making coarse counts of yarn we are not required to take out as large a percentage of waste as when we are making the firmer counts, and while enough waste should be taken out so that the yarn will not be bunchy, still it will be at once seen that the settings will not be as "close" as when the firmer counts of yarn are being made.

A low-grade, short-staple class of cotton is generally used for making the class of goods under description. Sometimes this is used straight but some mills use waste from the comber in the mixing as well as the low-grade cotton. Generally

TWO PROCESSES

of picking and opening are used, the speed of the beater being around 1,500 revolutions per minute, the beats per inch being between 42 and 45. The beater is run at a higher speed on short stapled cotton for two reasons: first, because it is necessary to run it at a higher rate of speed in order to get all the dirt out; and second, because it can be run at a higher speed because there is not so much liability of making neps, for the reason that the staple is short and does not ball up as easily as the long-staple cottons.

The weight of the whole lap at the finisher picker is about 40 pounds, or about 14½ ounces to the yard in length.

THE CARDS

are set so that the tops are about 12-1000 of an inch away from the cylinder wire (coarse wire being used on both cylinder and doffer fillets). The licker-in knives are set as close as possible without touching so that they may throw out as much dirt as possible. The draft of this machine should be about 100, the production from 750 to 1000 pounds for this class of goods and the weight of sliver per yard at the front about 65 grains per yard. The ones in charge of the cards should see that the cards are properly ground because when running large productions of low-grade cotton the wire on the fillet becomes dull and does not perform its duty.

TWO PROCESSES OF DRAWING

are used, generally 6 ends up. As the weight per yard of sliver is heavy at the drawing frame for this class of goods, a point to look out for is to see that the weights attached to the top rolls are sufficient to hold them down so that they will not jump. The weight of the sliver at the point of the finisher drawing should be about 75 grains and the speed of the front roll about 400 revolutions per minute; the hank roving at the slubbers about .40; at the first intermediate fly frame 1.40 and at the second intermediate 3.75 to 4.25 hank. From the second intermediate frame the roving goes to the spinning frame, where it is spun into the required yarn, or from

20s to 26s, being used for this class of goods, i.e., crinolines.

Dyeing Particulars.

Crinoline linings are generally dyed with a cheap logwood black.

Make up a solution of logwood extract at 6 degrees Tw. Add common wood acid, 6 degrees Tw., 1 pint acid, 1 gallon logwood, 6 degrees Tw. Run through two-box machine, pieces running into liquor 8 to 10 times, and through nip of two rubber rollers, liquor at the boil. Dry on cylinder drying machine, and run through chrome bath at ½ pound bichromate soda to 1 gallon water, and run through a steaming box to develop the color. Wash well in water. Starch, ½ pound dextrin, 1 gallon water. Boil the starch up for one hour before starching. Dry on cylinders or on tenter frames, as required. Some crinoline linings are calendered in friction calender, and afterwards embossed on embossing machine with a slash pattern.

Some crinoline linings are starched by hand in the tub, and stretched on a stenter frame and dried on the frame.

DAMASK FABRICS.

The name damask is technically applied to certain classes of fabrics, richly decorated with figures of foliage, fruits, scrolls and other ornamental patterns, usually of a large and elaborate character.

The weaves usually employed are twills(mostly satin) and the figures in the fabric are made by alternately exchanging warp for weft surface or vice versa.

The materials employed vary according to the purpose to which the fabrics are to be applied. In the manufacture of upholstery cloth for hangings and furniture covering, silk or worsted is used, while for tablecovers, towels, napkins, etc., linen is generally employed, except in the cheapest grades, when cotton is the material used.

The name was derived from the city of Damascus, when that city was a centre for the production of textile fabrics, and originally was applied only to silken fabrics, whose designs were very elaborately woven in colors and often with gold thread.

About the twelfth century the abovementioned city, even then long celebrated for the production of its looms, so far outstripped all other places for beauty of design, that her silken textiles were in demand everywhere, and thus, as often happens, traders fastened the name of Damascen or Damask upon every silken fabric richly wrought and curiously designed, no matter whether it came or not from Damascus.

In order to explain the modus operandi for the production of damask in this country, suppose we place ourselves in the position of a public designer, whose specialty is the designing of patterns for such fabrics.

THE SKETCH.

The first step in the operation is to prepare a dozen or more sketches, which are to be shown to manufacturers to take their choice. A specimen of such is illustrated at Fig. 1 (reduced), the original of which is drawn on ordinary tracing paper, the exact size, as it will appear in the cloth.

This design or sketch is to be made into a damask tablecover, having 50 threads warp and 44 picks weft per inch, the figure of which is to be a 5-leaf 4—1 satin twill (warp face) and the ground a 5-leaf 1—4 satin twill (weft face).

PROPER DESIGN PAPER.

The next step to be taken is to select the proper designing paper,the size of which,that is, the number of rectangles, warp and weft,in each large square, must be in the exact proportion to the number of threads (warp) and picks (weft) in one inch of the finished cloth. The mode of figuring is after the following manner:

Paper for warp ruled eight rectangles per large square; paper for weft ruled in the same ratio to eight as 44 is to 50.

Operation: $x : 8 : : 44 : 50$; therefore 44x8 equals 352 divided by 50 equals 7.04, answer. 7.04 is near enough to call it 7; therefore, 8x7 is the proper size of design paper required.

TIE-UP.

Then the tie-up must be considered, which in the present instance will be a 600-hook, with the tie-up as illustrated at Fig. 2 French system—point for border, and straight through for body, in six divisions.

The next process is to enlarge the design as it appears in the sketch, so that one repeat will exactly fit on 600 rectangles (warp) of the designing paper selected.

That portion of the border shown at A, in conformity with the tie-up should occupy the first 15 squares or 120 rectangles; that shown at B the next 15 squares or 120 rectangles; that por-

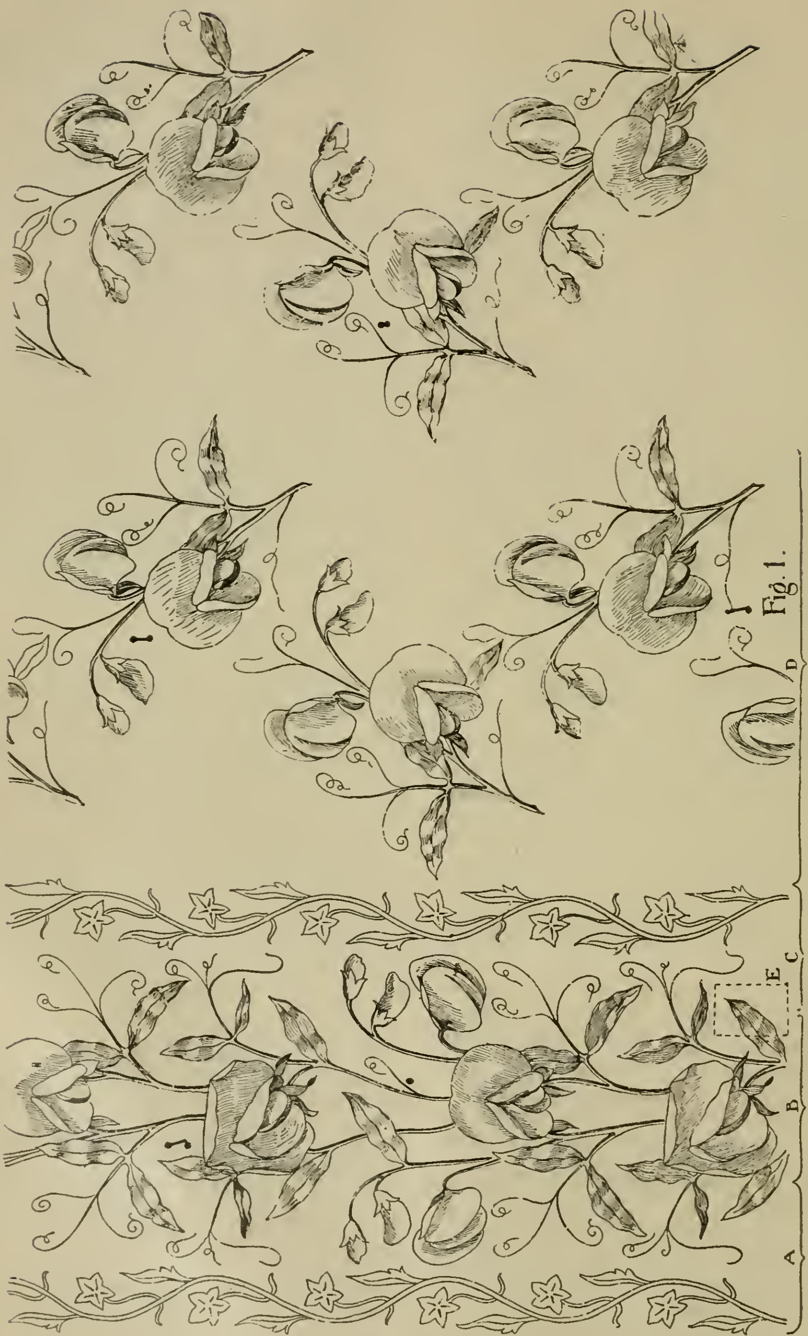


Fig. 1.

tion shown at C is not required on the design paper, because it is a repetition of that part shown at A, but simply reversed.

For the body of the design shown at D, 45 squares or 360 rectangles will be required, which will complete the 600 hooks of the machine. Summing them up they will be as follows:

Portion A = 15 sq. x 8 = 120 rectangles		Border.
Portion B = 15 sq. x 8 = 120 rectangles		
Portion D = 45 sq. x 8 = 360 rectangles		Body.
600 rectangles		

In order to ascertain how many squares or rectangles the design will occupy weft-wise the sketch must be measured, which in this case happens to be seven inches. Therefore 44 picks per inch times 7 inches equals 308 rectangles; but as 5, the number of threads in one repeat of weave (satin), will not divide into 308 evenly, 310 must be taken (310 divided by 5 equals 62). Therefore the design will occupy 600 rectangles (warp) times 310 rectangles (weft).

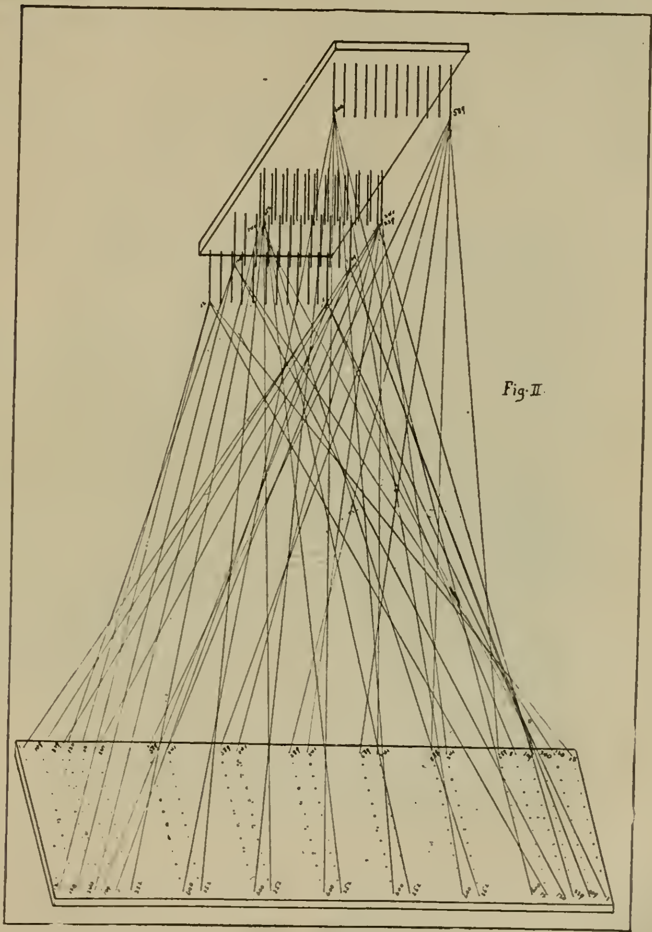


Fig. II

PAINTING IN THE DESIGN.

After the design is transferred to the design paper, the next process is to paint in the weave, in the following manner, or as shown by a portion of the design, taken from sketch at E, and illustrated by Fig. 3.

1. Paint in the figure in solid red (vermillion or scarlet lake), keeping well within the lines.
2. Paint in the 1—4 satin twill in the ground, running the twill toward the right.
3. Paint in the 4—1 satin twill in the

figure by using black paint over the red. Twill to the left.

In joining the ground and figure twills great care must be exercised so as to effect a clear outline between figure and ground, which is done by the following method:

Where it is possible to bring a riser (black) of the ground beside a sinker (white) in the figure weave or vice versa, it must be done and in some cases, where the risers and sinkers will not join, it is well to alter the weaves slightly so as to effect it; and where it is impossible to do this, then the weaves of each must not be extended border join perfectly with that of the body; and this is done by carefully examining the tie-up so as to ascertain which warp threads will join each other in the cloth and take steps to make a perfect juncture.

In this particular instance, warp thread No. 1, which is the first of the border, is in juxtaposition with warp thread No. 241, which is the first of the body. (See Tie-up, Fig. 2.) Therefore the satin twill of the body, commencing with warp thread No. 241, should continue, without a break, the satin twill of the border finished at warp thread No. 1.

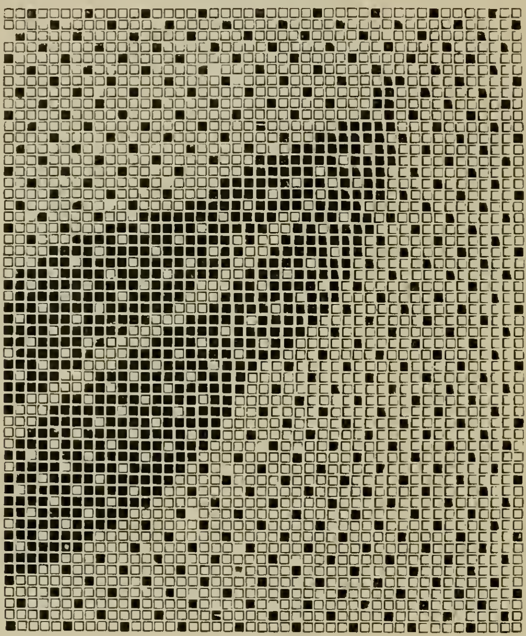


Fig. 3.

so as to actually join, but a certain length of weft in the ground must join a certain length of warp in the figure. (See portion of design, Fig. 3.)

When painting in the satin twill of the ground in the border of the design it is necessary that the twill should extend to the right for one-half the distance and to the left for the remainder, therefore, as this breaking of the twill line causes a slight imperfection, which is unavoidable, care must be used so as to make the break in such portion of the border as will render it unnoticeable.

Again it is necessary also to be careful so as to make the weave of the

WEAVES TO USE.

Athough in the majority of damask fabrics nothing but satin twill weaves are employed (principally 5 and 8 harness), very good effects are sometimes obtained by combining other weaves with the satin twills. For instance, one side of a leaf may be painted in with a satin twill weave, and the other side may be a straight twill, thus giving the leaf a shaded effect, which may be very pleasing.

Another method of shading and the one generally employed is to gradually change from warp-up to weft-up or vice versa, as illustrated by Fig. 4.

TWO METHODS OF MAKING DAMASK.

In damask there is probably a greater field for the production of large figures than in any other class of weaving. There are two methods of weaving damask. First, by the use of the ordinary jacquard, which is discussed in the present article, and second, by the use of what is called the compound pressure harness.

By the first method, although very elaborate figures can be woven and a fine cloth produced, yet by the second method a command is obtained over four or five times as many warp threads as by the first, thus allowing the production of a fabric of much finer texture and even more elaborate ornamentation.

A description of damask weaving by the use of the compound pressure harness will be given later.

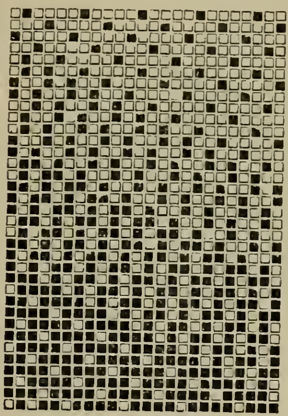


Fig. 4.

Where damasks are made all of one color, which is generally the case, as in white linen tablecovers, the effect is given by the threads lying at right angles to each other, and the light falling upon them brings the pattern in bold relief and makes it easily visible.

FINISHING OF CLOTH.

As it is impossible in the scope of the present article to describe the bleaching, dyeing and finishing of all the various damask fabrics, we can at least say this—that in the case of the linen tablecovers, towels, etc., all the finishing required is bleaching, starching and pressing.

But as the beauty of the fabric largely depends upon its whiteness, it is essential that the bleaching of the cloth must be very carefully done.

It is on account of the excellence of her bleacheries that Ireland has been able to make Irish linen famous the world over.

Carding and Spinning Particulars.

Cotton damask is made in several grades and should be considered as being made in mills equipped with machinery for making medium and high-class goods. The grades of cotton used for this class of cloth are middling to good middling, the staple varying from 1¼ to 1⅜ inches strong, according to the grade of damask to be made.

THE MIXING

should be as large as possible and, if good waste is used, i. e., sliver waste from the front of the cards, and drawings, also sliver waste from sliver lap machines and combers, and cut roving waste from the slubber and fly frames, it should not be used in larger proportions than 1 to 3. In up-to-date mills and in fact most mills nowadays it is the general custom to have a waste machine into which the cut waste from the slubber and fly frames is picked. This is called

A WASTE MACHINE.

This machine is constructed so as to take out all the twist in the roving and generally has for this purpose two or three porcupine beaters, and the cut roving waste is delivered in a fluffy sheet, from which all the twist has been taken. The good sliver waste from the machines above mentioned is mixed with the raw stock, while the cut roving waste, after being run through the waste machine, is fed to a picker and made into a lap of the same weight as the lap being used at the finisher picker, for this class of goods, and then

THE WASTE LAP

is run through with the raw stock lap at the finisher picker in the proportion of three laps of raw stock to one of cut-waste, the cut waste being generally put so that it will come in the centre of the delivered lap.

The cotton, after being mixed, is put through a hopper opener and either two or three processes of pickers, two processes being best, the speed of beater being 1050 revolutions per minute for openers, 1,500 for breakers and 1,450 for finishers, also 1,450 revolutions per minute for intermediate pickers, when used. This gives about 42 beats per inch at the finisher. The weight of laps should be 40 pounds at breaker, 37 pounds at intermediate and 36 pounds at finisher.

THE CARDS

should be set close, the speed of the flats making incomplete revolutions every 50 minutes. The draft of the card for this class of goods is about 110 to 125, doffer 24 inches, about 13 revolutions per minute,26 inches doffer, about 12, the production being about 500 pounds per week. In the drawing frames the rolls should be set ⅛ of an inch longer than the staple between the first and second rolls, and increase ⅛ of an inch between each set of rolls towards the back. The speed of the front roll should be about 400 revolutions per minute.

The general instruction given in a previous lesson on ginghams may be followed, except in the case of the hook roving.

IN THE FINER GRADES

of damask the comber is used and then only two processes of drawings are used instead of three, as is the custom when combers are not used.

Earlier in the lesson we have stated that cut-roving waste was used in the mixing. Cut roving results from badly made bobbins; bobbins not being marked, it being better to cut the roving off of these bobbins rather than to run the risk of getting them mixed up with other hanks of roving; bobbins on which there is a large amount of single or double, which is generally not allowed,but which will be made in spite of the most careful watching; bad bobbins resulting from breakdowns to machinery, and bobbins which are too small to send to the spinning or mule rooms. It is best to have

ONLY ONE HAND

to cut off these so-called bad bobbins. In larger mills one hand is employed to do this, but it is the general rule to have the third hands on fly frames do it. Under no consideration should the help (fly frame hands) be allowed to cut off the bad work which they make.

The cut roving should be sorted into piles of different lengths of staple, also into different piles, as to kinds; for example, Egyptian should not be put with Allan, even if of the same grade and length of staple.

WHEN CUTTING OFF ROVING

the hand should be careful not to cut the bobbin, because this in time will make the layers nearest to the bobbin stick to the wood, when they are again used. The bobbins containing a small amount of single and double should be pulled off by the hand making them, who may be found by the marks on the bobbin, if she allows the bobbin to go to the spinning or mule room. The hand gathering the roving waste should be careful not to mix the different staples and kinds and it should be taken to the picker room and placed in the different bins, provided for roving waste, which bins

SHOULD BE PLAINLY MARKED

as to staple and kind. The one collecting the waste should report all cut waste found and also those making an excessive amount of waste to overseer. The overseer should keep an account of this roving waste, as well as the good waste, so that he may at all times know just how much is made. In this way he is always in touch with the waste made in different departments and always know whether too much waste is being made. The boss picker is the best man to weigh all wastes, because it is to his department that the kick is made on account of bad laps. Reports are generally sent in once a week with the amount of waste for each day.

Damask Cloth Bleaching.

First, boil with 4 degrees Tw. caustic potash for 8 to 10 hours. Run through washing machine and place in kier for second boil, with 4 degrees Tw. caustic potash. Boil 8 to 10 hours.

The kier is the ordinary bleaching kier. After second boil, run through washing machine. Pass through solution of bleaching powder at ½ degree Tw. and plait down in bin for four hours. Pass through sulphuric acid ½ degree Tw. and wash well with washing machine, till all trace of acid is eliminated.

Starching: 8 to 10 ounces cornstarch; two ounces white cocoanut oil softening; one gallon water. Pass through starch mangle and dry on cylinder drying machine.

Damp pieces and give a calender finish.

ANOTHER HAMMOCK CLOTH.

Hammock cloth is a fabric composed of either jute, cotton, silk, silkaline or linen, and is intended for just such use as the name implies, that of a swinging couch or hammock. The all-cotton hammock is the most popular, and finds the readiest market. Hammocks composed of other material than all cotton are the exception, not the rule. The

TWO MOST IMPORTANT FACTORS

to be considered in the construction of

this fabric are: strength, and a pleasing color arrangement or combination, good yarns being used to provide the proper amount of elasticity of fabric, therefore strength.

Hammock cloth, when manufactured into that commodity known as hammocks, is more of a luxury than an actual necessity, being used only for outdoor purposes in warm weather. Hence the importance of attractive

COLORING.

Dry colors are used in cheap grades such as retail at about 75 cents. Fast colors are used in expensive grades, the price of which is from $1.50 upward. In all cases bright, rich, lively shades of color are necessary. Those colors most commonly used are red, blue, purple, pearl, black, white, green, as well as others in both light and dark shades.

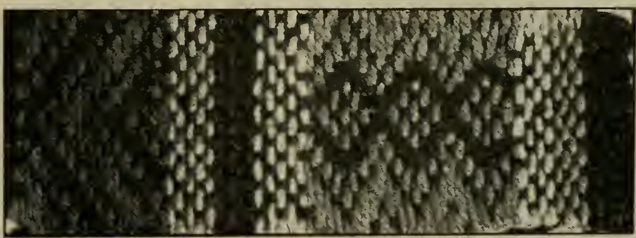
Hammock cloth is most successfully woven on the dobby loom, the very loose texture permitted by the use of twill weave.

In making a warp for a hammock, the colored and plain yarns are spooled upon six-inch spools. These are set up in the creel rack by the warper, in accordance with the pattern or color arrangement desired.

THE WARP

is made upon a section mill, each section being warped and run upon the mill the desired length; the number of sections in the completed warp is figured out by the warper, according to number of ends to be used, and the capacity of the creel rack.

To replenish a warp in the loom, if the same harnesses are to be used in the same manner as the warp just finished, the new warp is placed on the floor directly behind the loom to be filled, and the ends of both warps tied together by using a flat knot, the same as



Hammock Cloth.

cheap grades being made with a

SCRIM WEAVE

and from 6 to 8 ends and picks per inch, ⅜ cotton yarn. By using the dobby loom very rapid changes are possible, by altering the drawing-in draft wherever necessary. This is important in sampling and is rather expensive when applied to the jacquard loom.

In creating hammock styles, very elaborate imitation jacquard figures are produced by taking a design suitable for a dobby loom of about 20 harness, generally twill effects; and by dissecting the design and applying the parts (straight or reversed) to a series of broad and narrow colored stripes in the warp or warp pattern, we produce an effect

BOTH INTRICATE AND ATTRACTIVE.

Care should be taken, however, to insert several small stripes of plain weave, as this prevents the cloth from pulling out of shape on account of the is used in tying in carpet warps. This fabric requires

ABSOLUTELY NO FINISH

and is made up into hammocks immediately after leaving the loom.

Hammock cloth is made from 34 to 44 inches in width, and always of three or more ply yarns.

A good grade of hammock cloth can be produced by using: 3-10s cotton warp and filling; 750 reed, 42 inches wide; 18 ends, 16 picks per inch; weigh 8¼ ounces; measure about 38 inches from loom.

Warp pattern:

19 Light green
8 White
46 Navy blue
4 Black
23 Light Green
4 White
15 Light blue
4 Light green
29 Dark green
4 White
64 Navy blue
8 White
64 Navy blue.
12 Black
64 Light green
10 Black

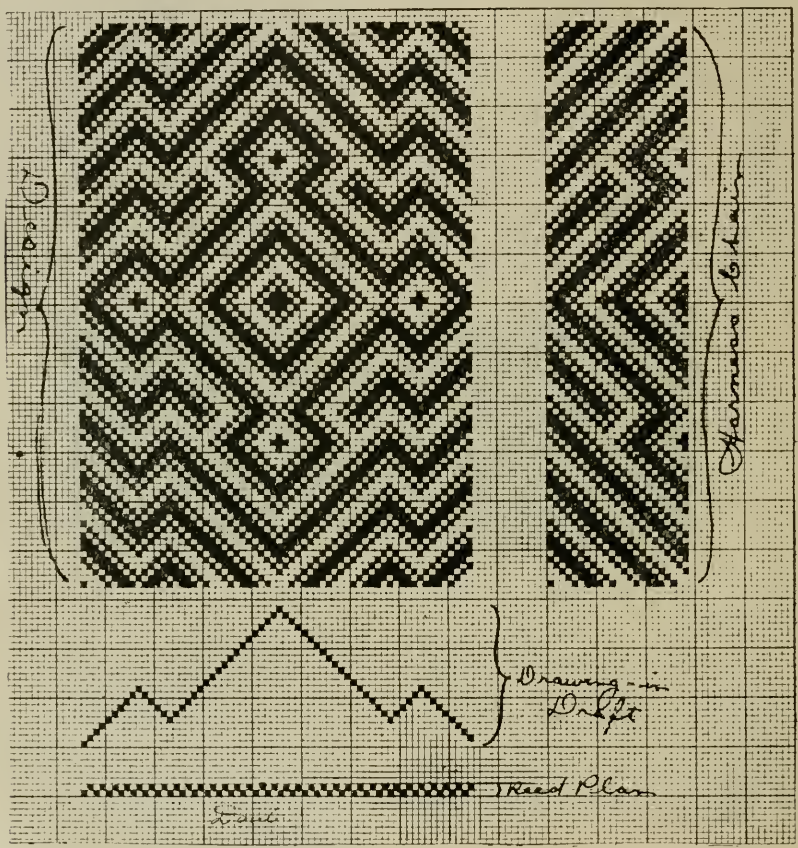
Read from top to bottom, then reverse.

Do the same in drawing in.

378 ends

Carding and Spinning Particulars

For this class of cloth, either a low-grade of short stapled cotton is used, or, as is more generally the custom, waste. When straight cotton is used, quantity is more to be looked out for than quality. By this it is not meant while the production may be greater for a short length of time, the ends breaking down at the front and the time lost in piecing them up constitute only one of the items that more than makes up for the loss in production of a more slowly driven machine, which will run more steadily and make evener yarn.



that quality is not considered at all, but that quantity or production is

THE MOST IMPORTANT POINT

of the two for this class of goods. The quality should be the next point. Get all the production that is possible from every machine, but always have one thing in mind, that it is not always the greatest speed of the front roll together with the heaviest weight per yard of sheet, sliver, roving or yarn being delivered that gives the most production at the end of the week.

There is always a speed over which it is folly to drive a machine because,

ANOTHER THING

that must be taken into consideration when reading these articles is that, while we describe the different processes through which the cotton has to go to make the required finished yarn, for the cloth, also the general settings of the machines required it would be almost impossible for one mill to make every cloth that will be described so that it must be understood by the reader that when reading the details of the different grades and kinds of cloth that one mill makes only several cloths of the same grade. So,

IN ORDER TO AVOID CONFUSION in the future, let us divide the mills into three different parts, first those using waste and low-grade cotton; second, those low and middling grades of cotton, and third, those using middling and high grades of cotton. While the differences are not so great between the first and second and the second and third as between the first aud third, still the differences are there in the number of processes used and the size of rolls also size of wire on certain machines. All that is asked of the reader is to consider which division of the mills the cloth under description belongs to and the rest will be very clear. Hammock cloth, of course, belongs to the first-named division.

For this class of goods the cotton is put through opener and picker; the speed of beater is one of the points to be looked after.

AT THE CARD

coarse wire is used on both fillets and the speed and setting of the doffer comb should be looked after to see that it is properly stripping the doffer. At the drawing frame a smaller second roll should be used so that the rolls may be set close enough together as the staple of the cotton being used is very short. At the slubber and fly frame this is also true. The one watchword with this class of goods is production.

Particulars for Dyeing Yarn.

LIGHT OLIVE.

One-half per cent benzo dark green GG; ¾ per cent chrysophenine; 20 per cent Glaubers; 2 per cent soda; enter at 120 degrees F. and raise to 180 degrees F., give six turns.

Benzo dark green GG, and chrysophenine are colors from Elberfeld Farbenfabriken.

VIOLET.

1¼ per cent benzo fast violet R; 20 per cent Glaubers; 2 per cent soda; enter at 120 degrees F.; give six turns to 180 degrees; color from Elberfeld Farbenfabriken.

YELLOW.

2½ per cent fast cotton yellow C, extra; 20 per cent Glaubers; 2 per cent soda; enter at 120 degrees F.; give six turns to 180 degrees F.; color from C. Bischoff & Co.

ORANGE.

2 per cent fast cotton orange 6R, Ex.; 20 per cent Glaubers; 2 per cent soda; enter at 120 degrees F.; give six turns to 180 degrees F.; color from C. Bischoff & Co.

RED.

3½ per cent benzo fast red GL; ½ per cent chrysophenine; 20 per cent Glaubers; 2 per cent soda; enter at 120 degrees F; give six turns to 180 degrees F.; color from Elberfeld Farbenfabriken.

BLACK.

5 per cent direct deep black E, extra 30 per cent Glaubers; 2 per cent soda; enter at 180 degrees F.; get up to boil, give eight turns; Farbenfabriken of Elberfeld.

PURPLE.

3½ per cent benzo fast violet R.; 30 per cent Glaubers; 2 per cent soda; enter at 150 degrees F.; and give eight turns; Elberfeld Farbenfabriken.

BLUE.

3½ per cent fast direct blue R.; 30 per cent Glaubers; 2 per cent soda; enter at 150 degrees F.; give eight turns at boil. C. Bischoff & Co.

BROWN.

3 per cent direct brown NX; 30 per cent Glaubers; 2 per cent soda; enter at 150 degrees F.; give eight turns at boil; C. Bischoff & Co. A great variety of colors are used in hammock cloths.

TERRY CLOTH OR TURKISH TOWELING.

Terry cloth or Turkish toweling is a fabric composed entirely of cotton yarns. In effect it is a single cloth, having rows of loops, formed by warp yarn, in regular order, on each side of the cloth.

In making this fabric, it is necessary to use two beams. No. 1 or the bottom beam contains the warp for making the body or ground of the cloth. No. 2, the top or terry beam, contains the warp for making the loops in the cloth or terry effect. Terry cloth is used in the manufacture of towels and Turkish bath robes, and, as to color, there are solid bleached towels, towels having side and cross border color effects, also stripe patterns for the bath robes, favorite colors being navy blue, old gold,

cherry red, light green, etc. The warps are of 2-20s to 2-30s cotton and the filling 1-20s to 1-30s cotton.

Terry cloth is a narrow fabric measuring about 25 inches from loom and can be made on the roller or cam loom or the dobby or jacquard loom, either style of loom of course having the terry motion attached; the jacquard machine being only necessary in making fancy border effects in conjunction with the filling box motion. Very good cross border patterns are produced on a mutual loom, having terry motion and dobby attached.

The terry weave is the three harness twill weave dissected, and the different parts of this weave placed together again in such a manner as to permit the forming of a series of loops on each side of the cloth in regular order, by the top or terry warp weaving slack, using only sufficient weight to permit of correct shedding.

In making terry on a roller or cam loom, four harnesses and four cams are necessary, two cams being warp effect and two cams filling effect. The top beam containing terry warp is drawn in on first and third harnesses and the bottom or ground warp on second and fourth harness, reeded two ends per split and placed in the loom, the first and third harnesses being strapped up to the first roller, the second and fourth harnesses being strapped up to the second roller. The harnesses are then connected with the treadles at the bottom of loom by means of jack straps, these treadles being in turn operated by the cams, which are set on a cam shaft.

The cams for this weave are those of a $\frac{2}{1}$ $\frac{1}{2}$ 45 degrees twill, and are so arranged on the cam shaft as to produce the terry effect. The warps are drawn in 1, 2, 3, 4, weaving one terry, one ground end.

The cams are arranged as follows:

One $\frac{2}{1}$ Warp effect cam.

One $\frac{1}{2}$ Filling effect cam.

One $\frac{2}{1}$ Warp effect cam.

One $\frac{1}{2}$ Filling effect cam.

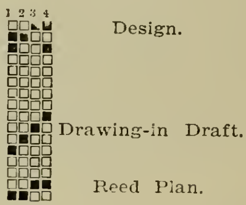
WEAVE.

First pick, first, fourth harness up, 2, 3, harness down. Second pick, first, second harness up; 3, 4, harness down. Third pick, first, second, harness down; 3, 4 harness up.

The terry motion is arranged thus:

At the bottom of the loom, near the side, there is a treadle, suspended in much the same manner as the cam treadles. To the treadle there is an iron (½ inch) rod attached and running up the inside of the loom and connected with an iron lever, which works upon a fulcrum, bolted to the loom side, the loom driving shaft rests in box or bearing on the side of the loom. This box is so shaped that it allows the shaft an eccentric motion, when the terry treadle is forced down by a cam, placed on the lower loom shaft for the purpose.

When the terry cam, revolving on the lower loom shaft, strikes the terry treadle, the rod connected thereto pulls down on the lever connected with the box in which is resting the driving shaft, the whole action throws the loom shaft and loom sley forward out of line, and the top warp working slack the reed draws the yarn through; then the terry treadle regaining its original position, the loom shaft settles back



1st Terry. 2d Ground. 31 Terry. 4th Ground.

to its correct position and the next pick of the loom binds in the slack warp, thus forming the loop in the cloth—the terry motion in this case working for two picks and stopping for one.

In weaving toweling on a roller loom, it being of short lengths of terry, the weaver allows the cloth to weave terry for any desired length, and to weave solid cloth without the loop. He throws the terry motion out of gear by dropping an iron finger down on the treadle. This holds the terry treadle out of the way of the revolving terry cam. This iron finger is usually either raised or lowered by means of a cord, fastened to the inner side of the breast beam and near the end of the loom.

This finger can be worked automatically by the use of a dobby motion or jacquard machine.

The terry warp, by weaving slack and forming the loops, will weave out at the rate of about 100 per cent faster than the ground warp. It is then replaced by twisting another warp to it,

this operation taking place at the loom and without removing the harnesses.

A good grade of terry cloth can be made as follows:

Reed—900, two ends per dent, 27 inches in reed; 2-30s cotton ground warp; 2-30s cotton terry warp; 1-30s cotton filling; 36 picks. Width from loom, 25 inches.

To be drawn and woven as stated above for a roller loom.

Carding and Spinning Particulars.

Yarn to make terry cloth or Turkish toweling belongs to the second division of mills i. e., the mills making cloth from low and middling grades of cotton (raw stock). The yarn is generally made from cotton of about 1-inch staple. The mixings should be as large as possible and good waste is generally thrown into the mixing bin at such times as it is usual to collect it from the different machines. It is usual in all mills to gather this good waste, which is really no more than the tail ends of laps, from the pickers, sliver which has not been properly coiled in the cans at the cards, combers and drawing frames, also any waste that contains the proper length of staple, which has been made at the different processes, which from improper care or handling or some defect in machinery cannot be used at the succeeding machine. This waste is generally placed in cans and collected at regular intervals and carried to the picker room and thrown back into the mixing bins to be used over again and is considered as raw stock. Of course it is understood that the different kinds or grades of cotton are kept separate. This method includes all machines up to the slubber and the procedure is the same as described in a previous article.

OPENING AND PICKING.

The cotton is passed through an opener and two processes of picking, the weight of lap being about 40 lbs. at the breaker and 39 lbs at the finisher, the speed of the beater being 1,500 revolutions per minute. This is a little faster speed than is used for higher class of yarns, because there is apt to be more dirt and foreign matter in the lower grades of cotton and the more beats per inch you have the more it tends to clean your cotton.

There is a limit, however, to the speed at which to run the beater, because, if run at too great a speed, it will tend to put nips into the cotton which are impossible to comb or card out unless you take out the whole bunch of fibres contained in the nip, which is a needless waste of good cotton when a little care at the beginning would have saved the nip. Nips make bunches in the yarn and show up clearly in the finished cloth, and, while it is impossible to make yarn without nips, it is always the object of all good carders to make as few as possible.

CARD SETTINGS.

The settings at the cards should be as follows: Flats from cylinder 10-1000ths to 12-1000ths inch; doffer to cylinder 7-1000ths inch: licker-in from cylinder 10-1000ths; feed plate to licker-in 12-1000ths to 20-1000ths inch,according to what style of nose you are using; licker-in knives to licker-in about 12-1000ths inch; back and front knife plates 12 to 17-1000ths inch, from cylinder wire at the lower edge, although the setting distance of the front knife plate varies because this helps to regulate the amount of flat-top waste taken from the cotton on the cylinder; cylinder screen from cylinder wire 20-1000ths to 24-1000ths inch at its nearest point to wire, which is the centre or directly underneath the centre shaft of cylinder. The outer edges of the screen are generally set about ¼ of an inch away from the wire. The sliver should weigh about 65 grains to the yard at the front of the card, the production being about 800 pounds per week of 60 hours.

THREE PROCESSES OF DRAWING.

The work is then put through three processes of drawing, the revolutions per minute of front roll being 400, the production per week 1,650 lbs. per delivery, the sliver weighing about 70 grains per yarn. The settings for finisher drawing frame are as follows: front roll to second, 1⅜ inches; second roll to third roll 1½ inches; third roll to back roll 1⅝ inches. The slubber hank should be about .40 hank; first intermediate 1.50 hank; second intermediate five hank. The spinning frame makes the required 1-20s yarns from five hank roving. Some overseers use one less process of drawing and add one process of fly frames, in which case the hank roving at the different processes of fly-frames would be as follows: slubber .40; first intermediate 1.10; second intermediate 2.70; fine frame, five hank.

To make the yarn 2-20s, it is doubled at the twister, two ends of 20s yarn being fed and being twisted into one thread of yarn at the front, but being called 2-20s yarn.

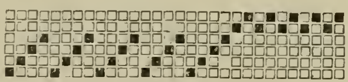
Bleaching and Finishing of Turkish Toweling.

If bleached in the ordinary way running through machine rollers in a bleaching works, the pieces will be drawn and sometimes damaged. Each piece is laid separately in a kier until the full amount of cloth has been placed therein, a solution of caustic potash at 5 degrees Tw. is run in, and boiled for 10 hours. Wash well and boil again with a 4 degrees Tw. of caustic potash. Wash well, and give a solution of sulphuric acid ½ degree Tw. Wash well and chemic with ½ degree Tw. chloride lime, for about four hours. Give an acid bath of ½ degree Tw. sulphuric acid. Wash well till all trace of acid has been eliminated.

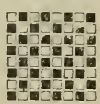
The goods should be dried on a tenter frame. A light starching, to give more weight, can be given of 4-6 oz. cornstarch per gallon, starch to be boiled for one hour. Run through a rubber rolled mangle and dry on a tenter frame. If a half bleach is required, a boil of caustic potash and an acid bath are all that are required.

CRINKLE OR SEERSUCKER.

This weave can be produced on less harnesses, but this number allow more freedom for heddles.


Drawing-in Draft.


Reed Plan.


Plain Weave for Crinkle.

Crinkle or seersucker is a wash fabric composed of cotton, cotton and silk or all silk, and can be easily woven in any power loom adapted to light and medium weight cotton goods, such as the old style roller loom, or the more modern dobby or jacquard. To make this fabric

TWO BEAMS ARE NECESSARY

as the crinkle or shrunken stripe is its peculiarity, hence the name. The part of the warp (which forms the crinkle in the cloth) is dressed on a separate beam and has only sufficient weight placed upon it to allow it (crinkle warp) to form a shed properly during weaving.

The ground or body of the cloth may be dressed upon one or more beams according to the difference in takeup, created by using combination weaves to form fancy corded or ribbed stripes in the body of the cloth.

To make a perfect crinkle fabric, use only

THE PLAIN WEAVE,

on both the ground and crinkle warps; as, for instance, if we desired to make a cloth having a plain stripe for 20 threads and a crinkle stripe for 10 threads, draw the plain or ground threads on four harnesses, straight draft, 1, 2, 3, 4 and the crinkle threads on two harnesses 1, 2 and reed the whole warp two ends per dent straight across from selvage to selvage.

The crinkle effect is produced by allowing this part of the warp to weave in slack, while the ground warp has the regular weight or tension placed upon it. In this way the slack warp very naturally forms a puckered or shrunken stripe in the fabric.

This fabric was in great demand some years ago, in fact about 1884, and was used extensively for ladies' wear in the line of summer outing dresses, petticoats, etc., but like most novelty fabrics it survived for a few seasons and was cast aside, being out of date, and something newer taking its place in the popular fancy.

A very good grade of crinkle cloth can be produced from the following:

STRIPE EFFECT (WARP PATTERN).

Reed, 1150—30 inches width in reed; 1-30s cotton warp and filling. (Regular yarns), 56 picks filling.

To bring out the puckered effect more prominently, draw crinkle warp two ends per heddle, four ends per dent. This necessarily increases the weight of the goods, also creating an opening for the working up of old stock yarns. Of course each manufacturer usually follows his own ideas of economy in constructing a fabric, consistent with the conditions and suggestions submitted to him by the trade through his selling agents concerning the nature and style of a sample fabric to be produced.

Following is the

FINISH

for goods constructed as per stripe effect: Goods are run through the washer, then through the cylinders or dryer, from the dryer to the tentering

machine. This operation stretches the goods to the original loom width if desired, also acting as an auxiliary dryer, after which they are run through the calender, which machine gives the cloth the appearance of having been newly ironed.

Carding and Spinning Particulars.

The mills making the style of cloth described above belong to the second division of mills given in a previous paper, i. e., those using low and medium staple and grade of cotton. These mills of course use the average settings on all machines with proper relation to the length of staple, etc. Of course, crinkle or seersucker is made of different counts of yarn in different mills, but these do not vary enough so that any change is made, except in the spinning room, which will be mentioned later. The seersucker under description will be considered to be made of 1-30s cotton yarn. The raw stock used for this yarn should be about 1 to 1⅜-inch staple.

IN THE MIXINGS

use other good waste, such as described in the last paper,also cut roving waste. As in previous mixings, make them as large as possible, and when possible put them through a bale breaker, and it would be a good idea to let the cotton stand as long as possible before using it (after mixing, of course). This allows it to expand and dry out and it is then in a better form for use. Different mills use different processes for the purpose of dyeing the cotton out and making the cotton mixing

AS FLUFFY AS POSSIBLE.

It is the general custom in up-to-date mills to use a blower in connection with the bale breaker. The cotton is fed into the bale breaker and junks are torn apart by the spikes on the rolls of the bale breaker and then the cotton is delivered on to an endless apron, which carries it over a chute into which the cotton drops. This chute allows the cotton to slide into a fan or blower, which revolves at a high rate of speed and the draft carries the cotton through, trunking either directly to the bin in which it belongs or drops it on to an endless lattice, which may be shifted to allow the cotton to drop into the bin where it belongs. It must be understood that cotton or raw stock is

COMPRESSED VERY TIGHTLY

into bales, and if some means were not taken to help the cotton regain its natural fluffy state the machines would have to do a great deal of heavy work for which they are not wholly built. Thus the bale breaker tends to separate the matted masses as they are taken from the bale and the air from the blower helps to air, dry and restore the cotton to a fluffy state, which is so desirable to obtain among carders. The cotton is allowed to stand as long as possible so that it will expand and dry out as much as possible before using,as the cotton in the bale collects more or less moisture from being in the cotton storehouses in general use.

The cotton used for 30s yarn is generally passed through

TWO PROCESSES OF PICKING,

if a blower is used. A good weight per yard of lap is 16 ounces and total weight of lap is 40 pounds at the breaker and 14½ ounces per yard and 39 pounds per lap at the finisher. The speed of the beater is the same as has been given for mills of the second division. At the card the draft should be about 100 to 110, which will give the weight of the sliver about 65 grains. The doffer should be speeded so as to give about 800 pounds production. The sliver is then generally run through three processes of drawing frames, a good draft of which is as follows: breaker, 5 plus; intermediate 4—; finisher 6; which will give the following weight of sliver per yard; at the breaker 74 grains; intermediate, 79 grains; and finisher,75 grains. Be careful of the settings of the rolls at the drawing. The hank roving at the slubber should be .45; at the first intermediate fly frame 1.40; at the second intermediate, or, as it is sometimes called, the roving frame, 3.5 hank and jack or fine frames, 7 to 7.5 hank. The roving is then carried to the spinning room where it is spun into 30s yarn. If yarn of a little higher or lower count is desired the draft gear is generally changed at this frame to give the required count.

Dyeing Particulars.

LIGHT BLUE.

For 100 pounds yarn, 1½ per cent immedial indone B pat.; 1½ per cent immedial sky blue cone; 5 per cent sodium sulphide; 10 per cent crystalline Glauber's salt; 3 per cent soda ash; enter at boil, boil one hour; wash well with water.

DARK BLUE.

For 100 pounds yarn: 8 per cent immedial indone blue Pat; 10 per cent sodium sulphide; 15 per cent crystalline Glauber's salt; 3 per cent soda ash; en-

ter at boil, boil one hour; wash well with water.

BLACK.

For 100 pounds yarn, 20 per cent immedial indone blue Pat; 10 per cent sodium sulphide; 15 per cent crystalline Glauber's salt; 3 per cent soda ash; enter at boil, boil one hour; wash well with water; second bath, one-half above proportions,

OLIVE GREEN.

12 per cent pyrogene olive N: 6 per cent sodium sulphide; 20 per cent Glauber's salt; 3 per cent soda ash; enter at boil; boil one hour, wash well with water.

BROWN.

12 per cent pyrogene brown G: 8 per cent sodium sulphide; 20 per cent Glauber's salt; 3 per cent soda ash; enter at boil, boil oue hour; wash well with water.

FINISHING PROCESS.

Starch with six ounces cornstarch; six ounces cocoanut oil white softening; one gallon water; boil starch for 45 minutes; rinse through starch mangle; dry on tenter frame.

COTTONADE.

Cottonade is a heavy, coarse, single cloth, made of single yarn, generally 1-20s cotton warp and 16-cut wool spun, weaving woolen principle, all-cotton shoddy filling. It is used as a trousering, an important feature of which is the low selling price of the finished garment.

It is best adapted to the old-style roller or cam loom, and is made and woven on four harnesses, generally the $\frac{2}{2}$ twill, either right or left hand, or herring-bone weave effect (twill running at angle of 45 degrees). It is a narrow fabric, being set in the reed 30 inches, and receiving very little finish and is sold at 27 inches in width.

THE PATTERNS

are usually on the dark side with a small percentage of bright color added to improve the tone: Black, dark slate and dark drab for ground colors, and an occasional red, pearl, light brown or an equivalent color to brighten the whole pattern.

In making a cottonade the object is to produce a cheap single-cloth trousering composed of a rather coarse but fairly strong single warp thread and a thick or lofty single filling thread, which combination in certain proportions gives the fabric a weighty appearance.

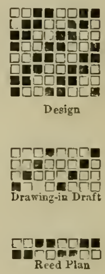
THE FILLING

is usually an all-cotton shoddy filling, made from old dark colored cotton rags. By willowing and pickering, the yarn is brought to the carded state. The fibres in an all-cotton shoddy are short, due to the process of reduction as stated above.

From the pickers the shoddy is run through the first and second breakers and then through the condenser or finisher card. The spool drum containing the roving is then taken from the condenser card and placed upon

$\frac{2}{2}$ 45° twill

Herring-bone effect.



$\frac{2}{2}$ 45°

Right-hand twill.

the mule to be spun upon tubes, ready for the weaver.

The fibres being short, the shoddy will lose from 15 to 20 per cent of its weight during the carding and spinning, also from the 3 to 5 per cent of waste made by the weaver.

To find stock at picker:

Cottonade, 30 inches in reed; 32 picks; 16-cut cotton (woolen principle) shoddy; 32 times 30 equals 960 yards divided by 300 equals 3.2 ounces filling, plus 5 per cent loss equals 3.18 ounces; 16-cut times 300 equals 4,800 divided by 16 ounces equals 300 yards per ounce; 3.18 ounces at loom plus 20 per cent loss in carding, spinning equals 3.82 ounces at picker per yard of cloth.

Cottonade, reed 800-2 ends per split, 30 inches wide, 32 picks, 16-cut cotton (woolen principle) shoddy, 1-20s cotton warp.

Finish about 27 inches. To finish run through dry hot press.

Weigh 4¼ ounces about.

Warp pattern:
10 Black.
2 Dark slate.
1 Red.
1 Black.
2 Dark drab.
1 Black.
1 Red.
2 Dark slate.

Design—regular $\frac{2}{2}$ 45 degree right hand twill.

THE WEAVING.

To weave in roller loom, this warp is drawn in 1, 2, 3, 4, on four harnesses, and these harnesses suspended in the loom from the rollers by means of straps attached to hooks on the top of the harness or heddle shafts. The harnesses are then fastened to the loom treadles by means of jackstraps running from the bottom of the harness to said treadles, the treadles being operated by a series of cams, consistent with weave effect desired.

These cams are so arranged on the cam shaft that in revolving they strike the treadles, and this action, pulling the harness up and down, opens the shed. (Note—in a roller loom two or more harnesses are always attached to one top roller, and of necessity whatever pulls one down must pull the mate harness up, the cams always being arranged to permit this.)

In applying this weave the first and third harnesses are strapped to the first top roller and the second and fourth strapped to second top roller. This being the case, the action of the cams in opening the shed causes the raisers and sinkers on each successive warp thread in the repeat of the weave to start one pick later than that of the thread preceding it, thereby forming a twill line.

A warp to be woven $\frac{2}{2}$ twill, drawn on four harnesses 1, 2, 3, 4, and strapped up in this manner, and having the cams set properly should shed thus: First pick, first and fourth up; second and third down. Second pick, first and second up; third and fourth down. Third pick, second and third up; first and fourth down. Fourth pick, third and fourth up; first and second down.

The herring-bone weave effect is produced by drawing in the warp from front to back and back to front in the harness and using the same set of cams, set in the same manner and position, and the same harness strapping as in making a straight right hard twill.

Carding and Spinning Particulars.

For this class of goods the cotton yarn is generally made and spun in the same way as wool and worsted yarns, and is generally made in mills and on the machinery generally used for making worsted or woolen yarns. It will be understood that the methods of making yarn in a cotton mill and a woolen mill are entirely different, both as to the number of processes used and as to the machinery used. In fact, the fundamental principles for spinning yarn are entirely different in each mill, and as we are describing cotton fabrics in these articles we will proceed just as if the yarn used for this class of goods was made at a cotton mill and sold to a woolen mill, which is sometimes done.

THE RAW STOCK.

The raw stock used for this class of fabric would be of a low grade and generally mixed with comber or even card waste; the percentage of waste used would depend a great deal on the count of yarn to be made. In the fabric under description the count of the cotton yarn is 1-20s. The raw cotton would be opened up and run through a bale breaker, or it may be opened at the bin and not run through the bale breaker which will save the expense of one process, but the cotton will not be opened up as well and a more even yarn yarn will be made when bale breaker is used. As the cotton is opened at the bin it is mixed with the carded or combed waste in the proportion required; the cotton layers being taken from the bale and pulled apart as much as possible so as to let the air get at them and also so as to lighten the work of the opener. The cotton is taken and put into the opener which is generally attached to the breaker picker, either directly or indirectly by having the cotton carried through trunking (through which it is blown by a draft of air from a fan on the opener) which connects with the back part of the breaker picker. The opener machine may be on the same floor or may be situated on the floor above or below the breaker picker; but in mills, as they are now constructed, the opener is on the same floor and is considered as a part of the breaker picker.

PARTICULARS TO BE OBTAINED.

For this count of yarn the speed of the beater should be about 1,050 revolutions per minute. The hopper

on the opener should always be kept more than half full of cotton and it should be as large as possible, the reason for this being that a more even amount of cotton will always be presented to the pin beater by the lifting apron than when the hopper is less than half full. This is important, not only in reference to "cottonade fabrics," but also all classes of goods, because if it is less than half full it is apt to cause uneven yarn. The speed of the beater on the breaker and finisher pickers should be about 1,500 revolutions per minute, which gives the beats per inch about 42. The weight of the lap at the breaker picker should not be less than 40 pounds and at the finisher less than 39 pounds. A 39-pound lap gives a weight of lap per yard of 14½ ounces. The card is set so as not to take out too much waste, and wider settings are used than those given in a previous article. The draft used should be 100, the sliver at the front weighing 65 grains. Production at the card should be at least 900 pounds. The sliver is then run through two processes of drawing, the weight of sliver at the finisher being about 72 grains per yard. The production per delivery of the finisher drawing frame should be at least 1,600 pounds per week of 60 hours and the percentage of lost time at this machine not more than 15 per cent. The slubber is the next process and the hank roving made at this machine should be about .40. Three-process fly frames are used and the hank roving at the different processes should be as follows: 1st intermediate 1.10 hank; 2d intermediate 2.75 hank; fine-frame from 4.50 to 5.00 hank. Care should be taken that the rolls are not spread too far apart on these machines and a good setting for rolls of this stock for slubbers and fly frames is as follows: Front roll to middle spread to 1¼ inches; middle roll to back roll 2 inches. The yarn is then taken to the spinning room where it is spun into 20s yarn, a soft twist being used.

Dyeing Particulars for Raw Stock.

BLACK.

For 100 pounds: 18 per cent pyrogene black B. D.; 12 per cent sodium sulphide; 8 per cent soda ash; 70 per cent salt. Enter at boil, boil one hour, and wash well in water.

PEARL.

One per cent pyrogene gray B; 2 per cent sodium sulphide; 2 per cent soda ash; 5 per cent salt. Enter at boil, boil one hour.

LIGHT BROWN.

Five per cent pyrogene brown G; 5 per cent sodium sulphide; 2 per cent soda ash; 5 per cent salt. Enter at boil, boil one hour, wash well.

RED.

Five per cent rosanthrene red A; 25 per cent Glauber's salt; 3 per cent soda. Enter at boil, boil one hour, rinse, diazotize for one-quarter hour with nitrite soda and muriatic acid, rinse.

Develop with beta naphthol and caustic soda for one-quarter hour. This red is brighter and faster than primuline red.

DIAZOTIZING BATH.

One and one-half per cent nitric soda, 5 per cent muriatic acid, 20 degrees be.

DEVELOPING BATH.

One and three-quarters per cent beta naphthol; 3 per cent soda ash.

DARK SLATE.

Two and one-half per cent immedial direct blue, B pat.; ¾ per cent immedial olive, B pat.; 5 per cent sulphide sodium; 2 per cent soda ash; 20 per cent Glauber's salt. Enter at boil, boil one hour.

DARK DRAB.

One and one-half per cent immedial brown, pat.; ¾ per cent immedial olive, B pat.; ¼ per cent immedial black, N B pat.; 20 per cent Glauber's salt; 2 per cent soda ash; 5 per cent sulphide soda. Enter at boil, boil one hour.

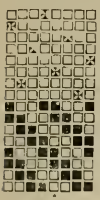
COTTON WORSTED—MEN'S WEAR.

Cotton worsted men's wear is a fabric composed of either 2-20s or 2-30s cotton warp and filling, and receives either a dry or wet finish. The weave, color arrangement and general construction are an exact duplicate of the finest worsted goods of the present time.

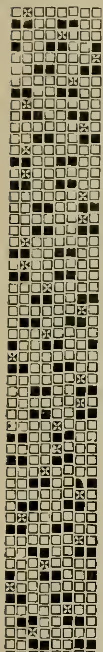
This fabric is used in the manufacture of men's suitings and trouserings, retailing at $7 to $12 per suit, for the middle class trade, and in effect has the neat dressy appearance of an imported cloth of high grade.

It is made in a light-weight grade

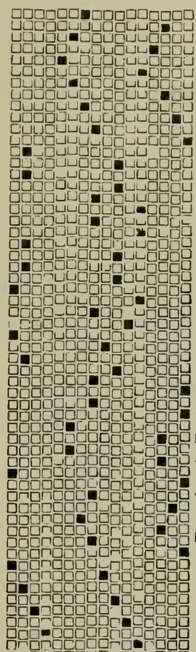
at 6 to 6½ ounces for spring and fall, and heavy weight at 8 to 8½ ounces for winter wear, both grades being produced in stripe,check, and indistinct plaid patterns.



Weave harness chain.



Design—Light Weight—Stripe.



Drawing-in Draft.

Reed Plan

Cotton worsted men's wear is usually woven on a Crompton & Knowles, Mutual or Fairmount loom, having either 4x1 or 4x4 filling boxes, and having a head motion attached such as the Crompton & Knowles, Mason, Ingraham, Stafford or Oldham, of from 16 to 25 harness capacity. Most all weave effects and combinations of weaves known in the worsted men's wear trade can be applied to this fabric. Care should be taken, however, in construction of weave, as the weave, when used in a worsted to produce a tightly bound rib effect, may appear more open in cotton worsted men's wear as the worsted fabric shrinks when scoured in finish and the cotton fabric is finished dry and is practically the same as when taken from loom, of course allowing for percentage of contraction between reed and cloth roll. Cotton worsted men's wear is usually made one face end and one back end, and reeded four ends per dent.

THE FACE WEAVE

when a twill, or fancy combination, is balanced on the back of the cloth by using an eight harness satin (warp effect on back) five as counter. The face weave should always be properly balanced. In making this style of goods, or a warp back fabric, the extra is placed there for the purpose of adding weight to the cloth, and if of a tighter nature, the face of the cloth will present a puckered or uneven appearance.

To dry finish cotton worsted men's wear, the yarns of which have been dyed from dry or cheap colors, that will not stand washing, the goods are taken from the loom and inspected, measured and sheared. Shearing is a process which means running the cloth through a machine, having a cutter composed of a series of blades set in a frame, which revolves in similar manner to that of a grass mower, the cloth being kept taut by being passed over and under several rods and rollers, which also remove wrinkles, and allow the cloth to be presented evenly to the cutter. The purpose of shearing is to remove all foreign substances from the face of the cloth, such as knots, lumps, etc., and the effect is a smooth, even cloth that readily takes on the appearance of a high-class worsted, after being run through the hot press.

The steam gauge on a hot press should register 50 pounds and the dial 135 pounds roller pressure when the cloth is run through this press. The effect of the pressure of the steam-heated rollers upon the cloth is to remove all wrinkles, liven up the colors, and to retain the width of cloth as taken from the cloth roll at the loom.

After being pressed, the cuts of cloth are rolled or sapped into bolts, the

ends of which are then stitched, the tags sewed on and the goods are ready to case and ship.

THE COLORS

used in cotton worsted men's wear are black, brown, light and dark shades of blue, slate, drab and steel, and to liven up a pattern use an occasional end of maroon, green, pearl or sky blue.

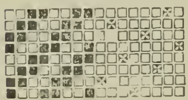
This line is also made in a piece-dye fabric, constructed from 2-20 and 2-30 cotton warps, and 1-30s worsted and 1-20 cotton filling. These yarns are woven in the gray and the cloth scoured and dyed in the piece, black or blue. When finished, this fabric resembles a very heavy serge. Finish, 28 inches.

ounces; 31½ inches in reed, including selvage 32x2; 2-20 cotton warp one face, one back: 52 picks, 2-26s black cotton filling. Dry finish equals shear and hot press. Weave, can use same as light weights.

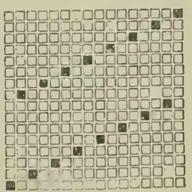
Carding and Spinning Particulars.

Cotton worsted fabrics, like cottonade fabrics, are generally made and spun in the same manner as wool and worsted yarns and made in woolen mills. There are a few exceptions, however, where they are made in cotton mills. The count of the yarn used in cotton worsted fabrics varies from 20s to 36s, and is generally a doubled yarn. In the present article we will proceed

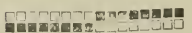
Design—Piece Dye



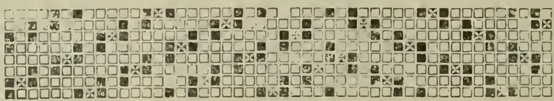
Weave Harness Chain



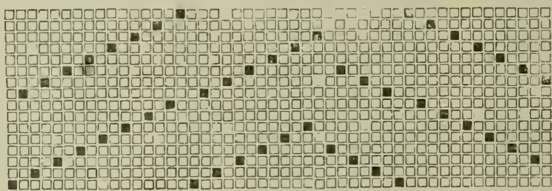
Drawing-in Draft



Reed Plan

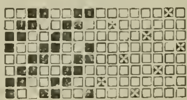


Design—Light Weight—Stripe.



Drawing-in Draft.

Reed Plan.



Weave Harness Chain.

Piece dye—worsted men's wear; reed, 500—eight ends per dent; 33 inches in reed, including selvage, 32x2.

1 end face 2-30 cotton warp; 1 end back 2-20 cotton warp, $\frac{2}{2}$ twill face, 8 harness satin back, 5 as counter.

1 pick 1-30s worsted; 1 pick 1-20 cotton; 56 picks per inch.

LIGHT-WEIGHT MEN'S WEAR.

Reed, 900—four ends per dent, 6½ ounces; 31½ inches in reed, including selvage 32x2; 2-30s cotton warp, one face and one back; 52 picks 2-30s black cotton filling. Dry finish equals shear and hot press. Weave twill combinations for face; weave eight-harness satin for back.

HEAVY-WEIGHT MEN'S WEAR.

Reed, 800—four ends per dent, 8½

as if the count of the finished yarn was to be 2-30s.

A mill making this class of goods would belong to the second division of mills (as classified in a previous article) i.e., a mill equipped with machinery for making yarns from low to medium grades of cotton.

THE MIXINGS

would be made in the usual manner, being run through a bale breaker into the mixing bin and at this point mixed with the sliver waste returned from the cards, drawing frames and combers (if there are any of these machines in the mill) and then it is run through an opener and through three processes of pickers. At the finisher picker laps of cut roving waste are mixed with raw stock in the proportion of three laps of raw stock to one lap of cut-roving

waste. In using cut-roving waste and also sliver waste it should always be of the same length of staple. It is

THE GENERAL PLAN

to use cut-roving waste as fast as it is made and not allow it to collect until a large quantity is on hand.

The method employed in most mills is to collect the cut-roving over a day (generally right after the noon hour) and take it to the picker room and run it through the roving or waste picker. From here it is run into a breaker picker and formed into laps of suitable weight. These are then mixed with the raw stock in the proportion above stated, as long as the cut-roving laps hold out (which should be as short a time as possible for obvious reasons). By doing this

A MORE EVEN YARN

is obtained than when the cut roving is allowed to collect for a week at a time before being put through the waste picker, because by the first plan you are mixing a small quantity of cut roving a good part of the time, whereas by the latter plan cut roving is only mixed with the raw stock once a week, while during the other five days nothing but the raw stock and sliver waste is being mixed. By the latter plan a more uneven yarn is bound to be made. The

SPEED OF THE BEATERS

on the different machines should not exceed 1,050 revolutions per minute at the opener, 1,500 revolutions per minute at the breaker picker, and on the intermediate and finisher pickers the speed should be slowed down so as not to exceed 1,450 revolutions per minute. This will give 42 beats to every inch of cotton fed to the finisher picker, which ought to be enough to thoroughly clean it. In giving the above speeds it is assumed that the rigid two-bladed type of beater is used. Different kinds of beaters, together with their advantages and disadvantages, will be given later when higher count yarns are described. The

WEIGHT OF THE LAP

at the breaker picker should be about 40 pounds or 16 ounces to the yard; at the intermediate about 37 pounds or 12 ounces per yard; at the finisher 39 pounds or 14½ ounces per yard. The settings at the card should be the same as described in last week's article per weight of sliver being 60 grains per yard and the production 850 pounds per week of 60 hours. The work is run through three processes of drawing, revolutions per minute of front roll at each process being 400 and the weight of the sliver at the finisher drawing 70 grains per yard. In order to help produce a perfect yarn, it is always a good rule never to draw more than you double at the drawing frame. For example, if you are feeding six ends at the drawing your draft should be six or under. The

PRODUCTION OF THE SLIVER

at the drawing frame should be about 1,600 pounds per delivery for a week of 60 hours. The next machine is the slubber, the hank roving at the front being about .40.

The yarn is run through three processes of fly frames and the hank roving made at each should be as follows: First intermediate, 1.20; second intermediate, 3.00; fine frame, 7.25 to 7.50. The yarn is then taken to the spinning room and made into 30s yarn; from here it is taken to the twister and made into 2-30s by doubling two yarns of single 30s yarns together.

Dyeing Particulars.

BLACK FOR YARN.

15 per cent immedial black N N; 12 per cent sodium sulphide; 5 per cent soda ash; 20 per cent Glauber's salt; enter at boil, boil one hour; wash well.

DARK BROWN.

8 per cent immedial dark brown A; 1 per cent immedial yellow D; ½ per cent immedial black N B; 10 per cent sodium sulphide; 5 per cent soda ash; 20 per cent Glauber's salt; enter at boil, boil one hour; wash well.

DARK BLUE.

3 per cent immedial indone B cone; 3 per cent immedial indone R cone; 3 per cent immedial direct blue B; 8 per cent sodium sulphide; 5 per cent soda ash; 20 per cent Glauber's salt; enter at boil, boil one hour; wash well.

PEARL.

For 100 pounds yarn: 2 ounces immedial black N R T; 8 ounces sodium sulphide; one pound soda ash; 5 per cent Glauber's salt; enter at boil, boil one hour.

DRAB.

For 100 pounds yarn: 2 ounces immedial black N B; 12 ounces immedial cutch G; one pound sodium sulphide; 5 pounds Glauber's salt; enter at boil, boil one hour.

SLATE.

For 100 pounds yarn: 2 pounds immedial direct blue B; three-quarters of a pound imedial olive B; 5 pounds sodium sulphide; 10 pounds Glauber's salt;

2 pounds soda ash; enter at boil, boil one hour.

STEEL.

For 100 pounds yarn: 12 ounces immedial black N B; 2 ounces immedial yellow D; 2 pounds sodium sulphide; 2 pounds soda ash; 5 pounds Glauber's salt; enter at boil, boil one hour.

GREEN.

5 per cent pyrogene yellow M; 5 per cent pyrogene green B; 10 per cent sodium sulphide; 20 per cent Glauber's salt; 5 per cent soda ash; enter at boil, boil one hour; wash well.

MAROON.

25 per cent Glauber's salt; 6 per cent Rosanthren C B; 5 per cent soda ash; enter at boil, boil one hour; wash. Diazotize: 1½ pounds nitrate soda; four pounds hydrochloric acid; turn for 15 minutes; develop two pounds beta-naphthol; 2 pounds soda ash; turn for 15 minutes; wash well.

SKY BLUE.

2 pounds immedial sky blue; two pounds sodium sulphide; 5 pounds soda ash; 15 pounds Glauber's salt; enter at boil, boil one hour.

FIGURED SILK (LENO) WAISTING.

Figured waisting is a light-weight wash fabric, generally composed of 1-40 cotton warp and either single or two-ply silk or silkoline filling, 1-60 silk and 2-60 mercerized or silkoline filling being in great favor for the past few years.

This fabric can be woven on either the dobby or jacquard loom having single or double box motion. Very

ELABORATE AND POPULAR STYLES

are created by using fancy granite weaves (filling effect) for ground, and for figuring use the filling effect of diamond, spot, crossed or curved twill weaves. These are so regularly arranged as to produce apparent jacquard patterns. Persian stripes can be produced by using bright colored extra warp threads and arranging the weave so as to raise them on the face of the cloth in Oriental or floral designs. Spots are sometimes woven into this fabric by using extra warp and clipping the long floats of yarn off the back of the cloth.

Very elegant styles are made by introducing leno or doupe weaving by means of white and colored fancy yarns to produce open or lace work in the cloth.

Figured waisting is made in both chambray and stripe pattern, always having white filling. For chambrays the following

COLORS

are serviceable: dark blue, light blue, brown, pink, red, pearl, steel, light green, tan, ecru, etc.

The combination of cotton warp and silk or silkoline filling creates a silky sheen on the face of the fabric as the light strikes it, and this in itself is its most important selling feature.

IN WEAVING

this fabric the take-up roller should be covered with fine sandpaper and this paper presents a more even surface to the cloth and does not draw the filling as is often the case where perforated tin is used as a covering on the take-up roller. The perforations usually cause small rough particles of tin to stick out prominently, and these catch on the long floats of the filling figure, and as the loom continues to run, the yarn clings to the roller and draws the filling, thereby spoiling the symmetry of the figure and causing imperfect cloth.

The tin covering very often causes clouded or thick and thin places in the cloth. Especially is this so when using a fine silk filling, and a great number of picks per inch.

To finish figured waisting the fabric is washed in a solution of soap and cold water, then dried by being run through the hot press. After the press of calender, the goods are folded on a folding machine (not lapped) in the same manner as sheeting, and after folding, each separate piece or cut is doubled in half and then wrapped in stiff paper, to keep out all dirt, after which it is ready to pack and ship.

(SILK) FIGURED WAISTING.

Reed, 1,300, 2 ends per dent; 38 inches in reed, to finish at 36 inches. 1,300 means 1,300 splits to 36 inches of reed. Warp 1-40s cotton: filling 1-60s silk filling, 64 picks. Take-up of warp during weaving, 15 per cent; 1,300 reed by 38 inches equals 1,372 splits; 2 ends to 1 split equals 2,744 ends plus 40 ends

for selvedge equals 2,784 total ends in warp.

WARP PATTERN.

16 White.
2 Light blue. } 3 times.
6 White.
2 Light blue.
16 White.
8 Cadet blue.
2 Sky blue.
2 Cadet blue
2 Sky blue.
12 Dark blue.
2 Sky blue.
2 Cadet blue
2 Sky blue.
8 Cadet blue.
—
134 ends in pattern = 67 splits.

19 repeats of weave and pattern plus 40 splits or 80 ends.

FIGURED (LENO) WAISTING.

Reed, 1,400—ends per dent, 2; 34½ inches in reed, including selvage; finish, 28½. Scour and calender.

WARP PATTERN.

88 Red 1-40 cot.
1 Black leno 2-20 merc.
4 White 2-40 cot.
2 White leno.
4 White.
2 White leno.
4 White.
2 White leno.
4 White.
1 Black leno.
—
112 ends = 68 splits.

Weight one yard, 2,286 ounces.

1752 ends + 15% take up = 2061 yds. 1-40 cot. =	.981 ozs.
40 ends + 15% take up = 47 yds. 1-40 cot. =	.002 ozs.
304 ends + 15% take up = 358 yds. 2-40 cot. =	.034 ozs.
38 ends black + 25% take up = 50 yds. 2-20 merc. =	.009 ozs.
114 ends white + 25% take up = 178 yds. 2-20 merc. =	.034 ozs.
56 picks x 34½ in. = 1932 yds. 2-60 merc. =	1.221 ozs.
Total	2.286 ozs.

——

Carding and Spinning Particulars.

Only mills having up-to-date machinery and also up-to-date ideas can hope to make figured silk leno. This class of goods requires a great deal firmer yarns than the other cloths that have been previously described, and these yarns are made in the third divisions of mills (as classified in a previous article), i. e., mills making yarn from middle to high-grade cotton. The

COUNTS OF YARNS.

for this class of goods vary from 30s to 60s warp and from 40s to 80s (single or double) filling. The filling yarn is generally mercerized and a great many times extra silk ends are used to produce a certain silk effect in the cloth. For the carding and spinning particulars we will consider the warp made up of 1-40s cotton yarn and the filling of 2-60s yarn.

THE COTTON USED

should be of a good grade and a great deal of Allan seed cotton is used. This is generally of 1⅜ to 1½ inches staple and should be as clean as possible.

In mixing this class of cotton, it is very important that all the bales mixed should be of the same length of staple, and the overseer, or in large mills both the overseer of carding and the cotton sampler, sample the cotton from every bale, and if it is not up to the standard staple and grade, the bale is laid aside either to be taken back by the cotton broker or used for making yarns, which can be made out of a shorter staple cotton. After this the cotton is put through a bale breaker (if the mill has one which it should) or the cotton may be mixed by hand, care being taken when this latter method is used that the layers of cotton taken from the bale are pulled apart as much as possible. The ones in charge of

THE MIXING

should watch the men while they are pulling the bales of cotton apart to see that they do not take too large layers from the bale and throw them into the mixing bin which they will do if possible so as to get through with the job as quickly as possible, for it is a dirty job at the best. The bins should be made as large as possible so as to accommodate as large a mixing as possible at one time, as large mixings help to make more even yarn than small mixings.

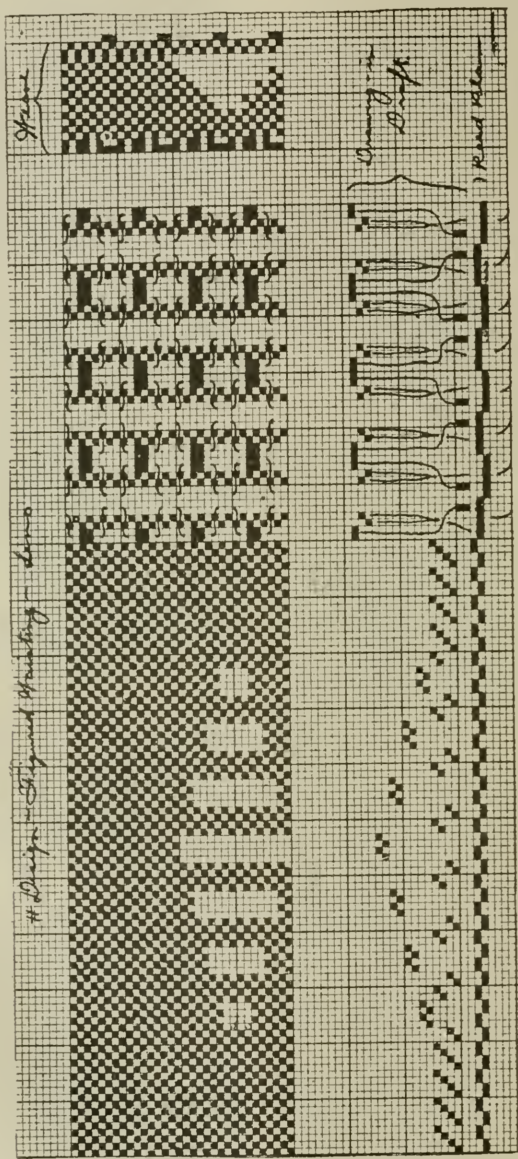
IN SOME MILLS

it is the custom to use two bins for mixing the same kind of cotton. The mixing is done as above described. But one bin is emptied at a time, while the cotton in the other bin is allowed to dry out while the cotton from the first bin is being used. Of course when one bin is empty it is immediately filled up again and the cotton is allowed to dry out in it until the second bin is emptied of cotton. When cotton is put through a bale breaker or any machine which opens the cotton up it is only necessary to use one bin and the cotton is or does not have to remain to air out, but may be used right away. The good waste from machines up to the slubber are used in the mixing, and cut-roving is run in at the finished picker (it having first been run through the roving waste machine and made into laps at a breaker picker). The raw cotton is taken from the bin and put through an opener and

TWO PROCESSES OF PICKING.

The speed of the opener beater should be about 1,000 revolutions per minute,

the breaker and finished beater (two-bladed) about 1,400 to 1,450 revolutions per minute. It may seem strange that the speed of the beaters on the opener neps into the cotton, but it is necessary to run the beater at a higher rate of speed for this class of cotton because it is very dirty.

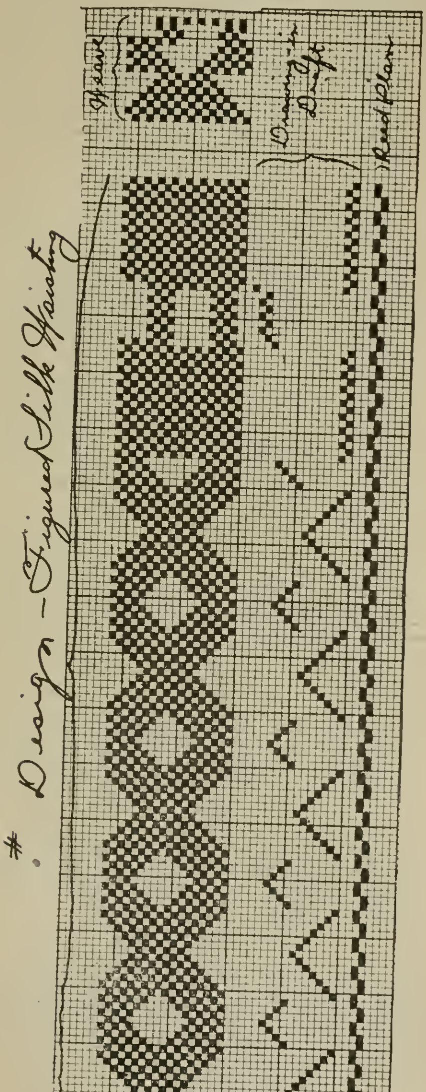


and pickers should be about the same as when low-grade cotton was used, because the general rule followed is that the longer stapled cotton being used, the less the speed of the beater, because longer cotton being used a highly speeded beater is apt to and does put

EXPERIMENTS

should be made with the beater in order to get it to run just fast enough so that it will take out the dirt and foreign matter in the cotton,and the above speeds are given only as a basis from which to work. The weight of laps at

the breaker picker should be about 16 ounces to yard of laps and at the finisher about 11 ounces to yard of lap, or for the finer counts 10 ounces per yard of lap may be used. The total



weight of the lap is 35 pounds and at the finisher picker receiving about 42 beats of the beater for every inch feed. The method of finding

THE BEATS PER MINUTE

is to multiply the revolutions per minute of beater to one revolution per minute of feed rolls (this may be calculated through the gears on the picker in the usual manner). Multiply revolutions per minute of beater by 2 (or 3 if a three-bladed beater is used). Divide this product by the circumference of the feed roll. For example, suppose that the beater made 197.5 revolutions per minute and was a 2-bladed beater; then 197.5 times 2 equals 395 divided by 3 (diameter of feed roll) times 3.14 plus equals 41.9 beats per inch. Ans.

THE CARD.

The next machine is the card, and at this machine we see changes. In the first the wire fillets on the cylinder and doffer are finer. A good size wire to use is 35s on the cylinder and 36 or 37 on doffer and top flats. All parts are set closer to each other with the exception of the nose of the feed plate in relation to the licker-in. The feed plate should be set so that the licker-in will not take the fibres being delivered before they are free from the bit of the feed roll and feed plate. The speed of the top flats is sometimes increased by lagging the top flats driving pulley. This is for the purpose of having more working flats on the cylinder and which consequently results in taking out more waste. The

SPEED OF THE DOFFER

is a great deal less and thus the production is smaller, for it is quality first and quantity second with this class of goods. Of course the quantity must be looked to to see that the production is as large as possible,but it must not be at the expense of quality. Sometimes on the finer counts of yarn the speed of the licker-in is reduced, and it is found to be of a great benefit to the sliver delivered at the front, because it not only cleans the cotton more thoroughly, but it also tends to.

KEEP THE NEPS OUT

and not to put them in. If carders have not tried this it might be a good plan to lag the licker-in pulley to 10 or 10½ inches diameter, instead of nine inches as it now is when using long staple cotton, especially Sea Island cotton. The draft of the card should be about 125 to 140, the sliver at the front weighing about 45 grains to the yard and the production of the card being not over 500 pounds per week of 60 hours. Grind cards both often and light. The cotton for this class of goods is combed and

BEFORE REACHING THE COMBER

passes through the sliver lap and rib-

bon lap machines, generally 14 ends up at the sliver lap and six laps at the ribbon laps. The weight per yard of lap at the ribbon lap machine should be about 260 grains. As the ribbon lap machine is at the drawing frame, never draw more than you double. In some mills the ribbon lap machine is not used, but where it is used it saves about 1½ per cent waste at the comber.

THE COMBER

should be properly set so as to take out about 16 per cent waste, the weight of sliver at front being about 45 grains to yard. The speed of comber for this class of cotton should be not over 90 neps per minute. This class of cotton is very hard to comb and should be watched all the time to see that it is being handled properly. After the comber two processes of drawing are used, the sliver at the finisher weighing 70 grains per yard. The settings of the rolls should be as follows: front to second 1⅝ inches, second to third 1¾ inches, and third to back 1⅞ inches.

THE SLUBBER ROVING.

should be .55 hank and the first intermediate fly frame roving 1.50 hank; second intermediate 4.00 hank, and 12 hanks or packs for spinning 60s and .55 hank slubber 2.00 first intermediate and 8.00 fine frame for 40s. Care must be used in setting the rolls as well as in the adjustment of other parts of the fly frames. The cotton is taken to the mule spinning room and spun into the counts mentioned above, from here it is taken and put through the different processes required and sent away to be mercerized.

Dyeing Particulars.

FIGURED SILK AND LENO WAISTING.

DARK BLUE.

10 per cent tetrazo sulphur blue B, 8 per cent sulphide soda conc, 3 per cent sal soda,50 per cent common salt. Enter at boil, boil one hour, rinse quickly in cold water and give three washings in water.

The tetrazo sulphur colors can be obtained from the New York and Boston Dyewood Company.

BROWN.

10 per cent tetrazo sulphur brown R, 1 per cent tetrazo sulphur brown G, 9 per cent sulphide soda conc, 3 per cent sal soda, 80 per cent common salt. Enter at boil, boil one hour, rinse quickly in water and then thoroughly three times.

PEARL.

1 per cent tetrazo sulphur black R extra, 1 per cent sulphide soda conc, 2 per cent sal soda, 10 per cent common salt; rinse well quickly in water, and then thoroughly three times.

STEEL.

1 per cent tetrazo sulphur black Ex, 1 ounce tetrazo sulphur brown G, 1 per cent sulphide soda conc, 10 per cent common salt; rinse well quickly in water,and then thoroughly three times.

LIGHT GREEN.

1 per cent new methylene blue GG.. ½ per cent thioflavine T, extra; enter at 120 degrees F. and get up to 160 degrees F. in 30 minutes, and turn five or six times and wash. To be dyed on yarn mordanted with tannic acid and tartar emetic.

TAN.

2 per cent tetrazo sulphur bronze, 2 per cent tetrazo sulphur brown G, 4 per cent sulphide soda conc, 3 per cent sal soda, 30 per cent common salt; enter at boil, boil one hour and wash well in three waters.

ECRU.

1 per cent tetrazo sulphur bronze, ¼ per cent tetrazo sulphur brown G, 1 per cent sulphide soda conc, 3 per cent sal soda, 20 per cent common salt; enter at boil, boil one hour, wash well in three waters.

RED.

4 per cent benzo fast red GL, 20 per cent Glauber's salt, 2 per cent sal soda, enter at 150 degrees F, give six turns to 180 degrees F., wash well in water.

PINK.

½ per cent diamond Rose GD, 2 per cent sal soda, 25 per cent Glauber's salt; enter at boil, boil one hour, and wash in water.

MEDIUM BLUE.

6 per cent pyrogene Indigo blue, 5 per cent sodium sulphide, 3 per cent soda ash, 25 per cent Glauber's salt; enter at boil, boil one hour, and wash well in water.

SKY BLUE.

2½ per cent immedial sky blue, 3 per cent sodium sulphide, 3 per cent soda ash, 30 per cent Glauber's salt; enter at boil, boil one hour; wash well in water.

DARK GREEN.

10 per cent pyrogene green B, 3 per cent pyrogene yellow M, 13 per cent sodium sulphide, 4 per cent soda ash, 30 per cent Glauber's salt; enter at boil,

boil one hour; wash well in four waters.

Finishing Particulars.

Starch with eight ounces cornstarch 6 ounces white cocoanut oil softening, 1 gallon water, boil one hour; dry over stenter frame and calender.

CORDUROY.

Corduroy is a narrow, all cotton fabric, the distinguishing feature of which is the perfect half-round regular ribs running warp ways through the cloth. As a fabric, it belongs to the general class of filling pile fabrics and is made of one system of warp and two of filling. The warp must be of good cotton staple to make a fine strong end. The pile filling should be of first-class cotton, soft spun, to blend more readily when the ribs are rubbed after being cut and brushed.

The warp and ground filling is woven either $\frac{1}{1}$, $\frac{2}{1}$ or $\frac{2}{2}$ twill, the pile pick weaves with either one, two, or three warp end, and floats over from three to 12 warp ends. The length of the float of pile filling depends upon the width of rib or cord desired in the fabric. The important point about the pile weave is to cause the pile filling to weave with the same two or three warp threads. This gives us lines of binding and lines of filling floats running warp ways.

The velvety ribs or cords, as noted upon the face of a corduroy.are created by first cutting the lines of floats of the pile filling. This operation is performed by hand with a very sharp steel knife, after which the ends of the floats are carefully brushed, and then rubbed together to the proper degree of consistency desired in ribs.

Corduroy is woven with from 160 to 500 picks of filling per inch; and is afterward dyed in dark blue, tan, buff, green and olive colors, to be used in making clothing for men.

It is also used for upholstery purposes, either in plain solid colors or the plain color has an elaborate floral design printed upon it. These printed patterns are usually in bright colors, such as red, yellow, light green.

IN PRINTING,

the design is first engraved upon a set of copper rollers. These are set into a regular machine, and as the cloth passes over them, the color being fed to the rollers automatically,the design is placed upon the face of the cloth.

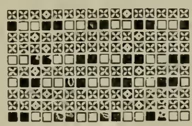
It is woven so as to finish from 27 to 31½ inches, the 27-inch for clothing and 31½-inch for upholstery.

This fabric requires a loom to be in good condition, as the beating in of such high number of picks per inch of filling is hard on the loom, and also necessitates slow production.

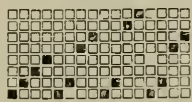
It is usually woven on dobby or witch loom, having single or double box.

Weaves are usually $\frac{1}{1}$ or $\frac{2}{1}$ or $\frac{2}{2}$.

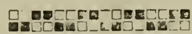
Filling, 1 ground, 1 pile, 1 ground. 2 pile, or 1 ground, 2 pile, 1 ground. 1



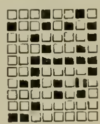
Design.



Drawing-in Draft.



Reed Plan.



Chain Draft.

Ground Weave $\frac{2}{2}$ twill.

⊠ Means floats of Pile Filling

⊡ Means sinking of Pile Filling under the warp for the purpose of binding in.

pile, this to be woven in a pick and pick loom.

Finish—Woven in the gray and dyed in the piece.

CORDUROY.

Four square inches equals 21.2 grains. Finished width, 31 inches equals 13.51 ounces.

48 ends per inch 2-28s cotton warp.
160 picks per inch 1-24s cotton ground filling.
240 picks per inch 1-20s cotton pile filling.

The above equals finished cloth.

Twenty pieces warp yarn, two inches equals 40 inches equals .65 grains; 40x 7000 equals 280000 divided by .65 equals 430769, equals 11965.8 divided by 840 equals 14.24 or 2-28s cotton warp yarn.

Eighty pieces ground filling, two

inches equals 160 inches equals 1.55 grains; 160x7000 equals 1120000,divided by 1.55 equals 722580, divided by 36 equals 20071.66, divided by 840 equals 23.89 or 1-24s cotton ground filling.

Weight of pile filling per one-half inch finished cloth two inches wide, equals 2.6 grains.

2.6 grains x 15½ equals 40.32x72 equals 3097.5 grains divided by 437.5 equals 7.08 ounces. Pile filling per yard, cloth 31 inches wide.

Forty-eight ends per inch finished times 31 inches equals 1488 yards plus 10 per cent take up in weaving equals 1653 yards of 2-28s cotton warp equals 2.249 ounces.

160 ground picks times 31 equals 4960 yards of 1-24s cotton filling equals 3.-936 ounces.

240 picks times 31 equals 7440 yards of 1-20s cotton pile filling equals 7.08 ounces.

7440 yards times 16 equals 119040 yards divided by 840, equals 1417, divided by 7.08 equals 1-20s pile filling.

CONSTRUCTION.

36 ends per inch in reed; 38¾ inches wide, 10 per cent take-up; 25 per cent contraction in width from reed to finished fabric; 18 per cent increase in weight in dyeing.

COLOR—DARK GREEN.

To be used for upholstery purposes.

$\frac{2}{2}$ twill weave.

Filling: 1 ground pick, 2 pile pick, 1 ground pick, 1 pile pick.

Carding and Spinning Particulars.

Yarn suitable for making corduroy is made in the second division of mills, given in a previous lesson. The raw stock used should be of a good grade cotton of about 1 inch staple. The mixings should be as large as possible for reasons already stated in previous lessons. One large group of mills, which make this class of goods, use a somewhat different machine for opening up the raw cotton from that which has been described, and instead of using an opener after the cotton is put through the bale breaker, it is fed to a machine called

THE WILLOW.

The cotton is fed into the machine in small lots and the machine pulls it apart and thoroughly airs it. Some overseers claim that this machine treats the cotton to a more thorough airing than when an opener is used. It is again claimed that, in consequence of this fact, the cotton may be used right from the bale or mixed at this machine. It is an English machine, and while this system is used to some extent in England, it is the general custom to use the opener in this country. Good sliver waste from the cards and drawing frames is used in the mixing, as is also the sliver and lap waste, from the comber room, when the mill is equipped with combers.

TWO PROCESSES OF PICKERS

are used with either a willow or an opener. Cut-roving waste is used and is mixed in at the finisher picker in the way that has been described in a previous lesson. If an opener is used, the speed of the beater should be about 1,000 to 1,100 revolutions per minute, with a speed of the fan about 350 revolutions per minute. The speed of the beater at the breaker picker should be about 1.500 revolutions per minute, and the speed of the fan about 1,400 revolutions per minute. A good weight for the lap made at the breaker picker is 40 pounds, while a good weight per yard of lap is 16 ounces. At the finisher picker the speed of the beater should be 1,450 revolutions per minute for a two-bladed beater, or 9.50 revolutions per minute for a three-bladed beater. The speed of the fan should be about 1,100 revolutions per minute with either beater.

A GOOD WEIGHT

for the lap would be about 38 pounds and the weight per yard 14 ounces. To get the grade of cotton used for this class of cloth clean, about 42 beats should be given to every inch of cotton fed at the back of the finisher picker. In other words, every inch of cotton should be struck 42 times before it is passed by the beater. With the above speed of the beater (1,450) this would be the number of blows that every inch of cotton received. Don't forget that it is very important to remove the fly from underneath the pickers at regular intervals during the day, because, if the fly is allowed to accumulate to any great extent, it might be drawn into the already cleaned cotton passing through the machine, and it is sometimes done as all persons working around cards know, as they have seen at various times large patches of fly on the lap of cotton. This of course requires the card

TO DO EXTRA WORK

and clean and take out this dirt. It very often results in bringing up the feed roll or the licker-in of the card, if not noticed in time to remove the fly. It will be seen that it is important

to keep the picker room clean at all times. It is very important to keep foreign matter, such as nails or pieces of metal, out of the cotton in the picker room, because of the liability of fires in the pickers, these being started by the foreign substance coming in contact with the quick moving beater blades and a spark being struck which ignites the cotton. This is apt to cause a bad fire if not promptly attended to. The

SETTINGS OF THE CARD

should be the same as given in a previous lesson on yarn, made in the second division of mills. The draft of the card should be about 100 to 125 for this class of cotton, the weight of the sliver at the front 65 grains to the yard; production, about 800 pounds per week of 60 hours. Three processes of drawing are used, the weight at the finisher drawing being 70 grains per yard. The hank roving at the slubber should be about .55. The two-process fly frame is used, the hank at the first intermediate being 2, and at the second intermediate 6.00 hank roving. The rule for settings at these machines for this hank of roving has been given.

The spinning frame spins all the required counts for this hank roving, which, of the corduroy under description, is 20s, 24s, and 28s, by changing the draft gear. The 28s yarn is then taken to the twister and doubled, so as to make 2-28s. A good sizing for the slasher for this class of goods is as follows: Water, 100 gallons; potato starch, 70 pounds; tallow, four pounds; turpentine, one pint.

Dyeing Particulars.

These goods are dyed at the jigger machine, a piece of 30 pounds being dyed. Care must be taken not to crush the pile.

One-dip colors are used for some goods, but, as the sulphur colors are so much improved, the bottom color is dyed with sulphur colors, and the goods topped with brighter aniline colors.

COLOR NO. 1—BLACK.

Blacks are sometimes dyed with a sulphur black as a bottom color. For 30 pounds of cloth (all of these colors are for 30 pounds of cloth): 15 gallons liquor, 3 pounds immedial black V Ex., 2 pounds sodium sulphide, 3 pounds sal soda, 3 pounds common salt. Dissolve in separate tub, boil and strain through cotton cloth. Add to jig, in two portions, at first two ends. Run for 30 minutes at boil. Rinse in jig. Aftertreat with 1 pound bichromate potash, one-half pound sulphate iron. Rinse well and dye logwood black. Rinse well and top with a paint color as Prussian blue, or dye with a basic color.

ANOTHER BLACK.

Dye as color No. 1, with immedial black, and top with oxydiamine black AM, and rinse. Top with basic color or paint with Prussian blue.

DARK BLUE.

2-4 pounds immedial blue C, 2-4 pounds sulphide sodium, 3 pounds soda ash, 3 pounds common salt at 175 degrees F. Run 30 minutes. Aftertreat, cold 15 gallons liquor, 4 pounds peroxide soda, 6 ounces ammonia. Run 20 minutes.

For further batches, half the amount of drugs will suffice. The color can be shaded up with basic colors.

TAN.

1 pound immedial brown B, 1 pound sodium sulphide, 2 pounds sal soda, 3 pounds common salt. Run at boil for 20 minutes. Top with Bismarck brown.

BUFF.

1 pound immedial bronze A, 2 ounces immedial yellow D, 2 pounds sodium sulphide, 2 pounds sal soda, 3 pounds common salt. Run at boil 30 minutes. Rinse and aftertreat. 1 pound bichromate of potash.

PEARL.

3 ounces immedial black V extra, 1 ounce immedial brown B, 1 pound sodium sulphide, 2 pounds sal soda, 2 pounds common salt. Run at boil 30 minutes. Aftertreat, ½ pound bichromate potash, ½ pound sulphate copper.

RED

2 pounds diamine fast red F, 10 pounds Glauber's salt. Run one hour at boil. Rinse. Aftertreat, ½ pound fluoride chrome. Top with diamine scarlet or safranine.

GREEN.

1 pound immedial black V extra, 2 pounds sodium sulphide, 2 pounds sal soda, 3 pounds common salt. Run 30 minutes at boil. Rinse. Top with solid green crystals O.

LIGHT GREEN.

½ pound katigen chrome blue 5G, 1 pound sodium sulphide, 2 pounds sal

soda, 3 pounds common salt. Run 30 minutes at boil. Rinse. Top with auramine and green.

OLIVE.

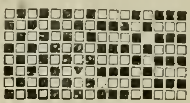
1 pound pyrogene olive N, 2 pounds sodium sulphide, 2 pounds sal soda, 3 pounds common salt. Run 30 minutes. Rinse. Top with auramine and Bismarck brown.

DARK BROWN.

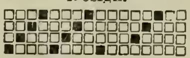
2 pounds sulphur brown, 4 ounces sulphur black, 3 pounds sodium sulphide, 3 pounds common salt. Run 30 minutes. Rinse. Top with auramine green, Bismarck brown or paint a brown on top, or dye a catechu and chrome bottom, and top with the above brown.

DIMITY.

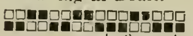
Dimity is a light-weight cotton wash fabric, the distinguishing feature of which is the cords or ribs running



Design.



Drawing-in Draft.



3 ends per heddle and dent.

Reed Plan.

Chain Draft.

warpwise through the cloth, and produced by doubling the warp threads in either heddle or reed in sufficient quantity to form the rib desired.

Dimity is a ladies' summer dress fabric and is made of regular cotton yarn, from 1-60s to the very finest counts in both warp and filling, and is made in white and colors, solid white being used in the more expensive grades (warp and filling).

Dimity is made in ribbed stripe effects, and in such colors as ecru, pearl, light blue and blue. These colors are sometimes printed upon the face of the fabric, after it has been woven in the white.

Jacquard scroll and other figures are printed upon the white dimity to create elaborate patterns.

Dimity is always woven with a plain weave $\frac{1}{1}$, and by printing fancy floral designs upon the white surface of the cloth, that compactness of texture is retained which the plain weave alone can give. If, for instance, the floral effect were woven into the cloth, ends and picks remaining the same as for the plain weave, there would be created loose places warpwise of the cloth, due to the warp floats in forming figures.

Dimity, being a light-weight fabric composed of very fine yarns, is therefore best adapted to the lightest running looms. A plain or dobby loom would be the most suitable for this fabric; one capable of weaving from two beams, as these are usually woven.

Dimity is made in grades having from 64 ends and picks per inch to 100 and more ends and picks per inch, the count of the yarn varying in accordance with the degree of texture desired.

Dimity as a dress fabric has a rather soft feel, and so receives but very slight amount of starch in finishing, which process includes washing, drying and calendering the goods, which are afterward rolled or lapped into bolts, "each cut or piece constituting a bolt." Each bolt or piece is then folded, the paper bands put on, and the goods are ready to pack and ship.

Construction.

One square inch equals .6 grain.

28½x36 equals 1,026x6 equals 615.6 divided by 1 square inch equals 615.6 divided by 437.5 equals 1.407 ounces per yard; 28½ inches wide finished.

40 pieces white warp yarn x 1¼ inches equals 50 inches equals .16 grains; 50x7,000 equals 350,000, divided by 1-6 equals 2,187,500, divided by 36 equals 60,762, divided by 840 equals 1-72s cotton warp.

35 pieces white filling yarn x 1½ inches equals 52½ inches equals 1.6 grains. 52½x7,000 equals 367,500 divided by .16 equals 2,296,875 divided by 36 equals 63,691 divided by 840 equals 1-76s cotton filling.

28½ inches wide finished, 106 ends per inch finished, 84 picks per inch finished, equals 29 3-5 inches in reed, 100 ends per inch, 80 picks per inch loom.

1,800 reed—2 ends per dent (ground),

cord—3 ends per dent and heddle, 5 per cent take-up in weaving.

3,021 ends plus 5 per cent equals 3,180 yards 1-72s cotton warp equals .841 ounces, 84 picks times 28½ inches equals 2,394 yards 1-76s cotton filling equals .6 ounces, total 1.441 ounces; 1.441 ounces per yard finished.

Carding and Spinning Particulars.

Dimity, or rather the counts of yarn required to make this style of cloth, requires first-class machinery and it is, therefore, made in the third division of mills as given in a previous article. The grade and length of staple of the cotton used varies with the weight per yard of the cloth being made and may be composed of 1½-inch. Allen cotton to 2-inch Sea Island cotton. For this lesson we will consider the counts to be 80s and the cotton used to be 1⅝-inch Sea Island. The mixings should be large and cotton allowed to dry out before being worked. As Sea Island cotton is comparatively a clean cotton it

REQUIRES LESS CLEANING

than other cottons, and another reason for putting it through less processes in the picker room is because of its length. If run through too many beaters the cotton is apt to be filled with neps. For Sea Island cotton of medium to long staple, i. e., from 1⅝ to 2¼ inches, it is better to use only opener and one process of picking as compared with two processes of picking for other grades of cotton. The should not exceed 1,000 revolutions per minute, for a rigid two-bladed beater. This gives the cotton passing through the finisher picker about 29 blows or beats per inch. The laps should not be as heavy as when lower grades of cotton are used and a good weight of lap at the finisher picker is 30 pounds or 10 ounces to the yard. The card setting points should be set as close as possible with the exception of the feed plate to the licker-in. The space between these two parts should be increased to the correct length of the staple being used. The

DRAFT OF THE CARD

should be increased to 125 or even 150, the speed of the licker-in made slower by lagging the licker-in pulley to 10½ inches, the speed of the flats speed of the beater should also be slower and at the finisher picker increased and the sped of the doffer slower. The production of the card for fine counts of Sea Island yarn should not exceed 350 pounds per week of 60 hours, the weight per yard at the card being 40 grains per yard. The stock is then passed to the comber room and is here passed through the sliver lap and the ribbon lap machines and from here to the comber. Generally seaking, 14 ends are doubled at the sliver lap machine and the weight of the lap at the front is about 230 grains. Six laps are put up at the ribbon lap machine and the

WEIGHT OF LAP DELIVERED

is about 200 grains per yard. In very fine work only five laps are put up at the ribbon lap machine. The comber used is what is termed a six-headed comber, and the draft of this machine

SAMPLES OF DIMITY.

is considerable. The amount of waste taken out at the comber is more than that taken out of all the rest of the card room combined and for the cotton under description is from 20 to 25 per cent. The weight of the sliver being delivered is about 34 grains and the production of a six-head comber making 85 nips per minute is about 240 pounds per week of 60 hours. The cotton is next put through two processes of drawing, the weight at the finisher drawing being 55 grains per yard. The slubber makes this sliver into a .80 hank roving.

THE HANK ROVING

at the first intermediate is 2.25; at the second intermediate 5.00 hank and at the jack 18.00 hank. Care should be taken with the settings of the rolls at all the machines, and also the cotton in process should be kept as free from dirt and bunches as possible. Cleaners should be frequently picked so that the bunches gathered on them will not pass through into the cleaned cotton.

The cotton is next carried to the spinning room, some mills using ring frame yarn for both warp and filling and some mills using ring spinning for warp and mule spun yarn for filling. We will consider that the warp yarn is ring spun and the filling is ring spun. The doublings at the ring frame are 2 into 1 and the draft of the machine about 9 minus. It will be understood that

ONLY THE LATEST STYLES

of ring frames can spin 80s yarn, and to do it it is desirable to have the guide rolls rotate so that the roving being drawn over them will not be broken. For 80s yarn a good gauge of spindle is 2¾ inches with a 1¼ diameter ring and a 4½-inch traverse. The size traveler to be used varies and the correct one is only found by experimenting, but a good foundation to work from is a 22-0 traveler. The standard warp twist is 4.75 x square root of count. The speed of the spindles should be 9,400 revolutions per minute and the production about .32 pounds per spindle per week.

The filling is made at the mule and all that need be said about this machine is that the twist is less only 3.25 x the square root of the counts being put in. A good size to use for slasher is as follows: Water, 100 gallons; potato starch, 54 pounds; Yorkshire gum, 2 pounds; soap (white), 172 pounds; paraffin wax, 1 pound.

Dyeing Particulars.

PINK.

For 100 pounds of cloth, 1 ounce benzo fast pink 2BL, 10 per cent soap, 150 degrees F.

LIGHT SKY BLUE.

½ per cent immedial sky blue powder, 1 per cent sodium sulphide, 1 per cent soda ash, 10 per cent Glauber's salt; wash well and top with 1 ounce Methylene blue O O.

LIGHT GREEN.

4 ounces brilliant benzo green B, ½ ounce chrysophenine, 10, per cent soap, 150 degrees F.

PEARL.

4 ounces immedial black NRT, ½ per cent sulphide sodium, ½ per cent soda ash, 2 per cent Glauber's salt.

GRAY.

4 per cent immedial black NRT, ¼ ounce immedial olive-B, ½ per cent sulphide soda, ½ per cent soda ash, 2 per cent Glauber's salt.

LIGHT SLATE.

½ pound immedial direct blue B, ¼ ounce immedial olive B, ½ pound sulphide soda, ½ pound soda ash, 2 per cent Glauber's salt.

SLATE.

1½ per cent immedial black NRT, 1½ per cent immedial direct blue B, 3 per cent sodium sulphide, 1 per cent soda ash, 10 per cent Glauber's salt.

ECRU.

½ per cent immedial bronze A, ⅓ ounce immedial yellow D, 1 pound sodium sulphide, 1 pound soda ash, 10 pounds Glauber's salt.

LIGHT TAN.

½ per cent immedial cutch G, ½ per cent immedial orange C, 1 per cent sodium sulphide, 1 per cent soda ash, 10 per cent Glauber's salt.

NAVY BLUE.

3½ per cent immedial indone B, 2½ per cent immedial direct blue B, 5 per cent sodium sulphide, 2 per cent soda ash, 20 per cent Glauber's salt.

SCARLET.

5 per cent benzo fast scarlet 8 BS, 30 per cent Glauber's salt, 2 per cent soda ash.

SALMON.

4 per cent benzo fast orange S, 1 ounce benzo fast scarlet 8 BS, 10 per cent Glauber's salt, ½ per cent soda ash.

MAUVE.

4 ounces benzo fast violet R, 2 ounces

benzo fast blue BN, 10 per cent Glauber's salt, ½ per cent soda ash.

Finishing Particulars.

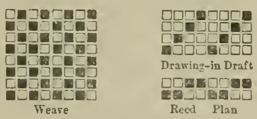
Mix up cold ½ pound white German dextrine, 1 gallon water, boil one hour, and starch through mangle and dry over tenter frame.

CHAMBRAY.

Chambray is a light-weight, single cloth fabric, that is always woven with a plain weave and always has a white selvedge. It is a staple fabric of many years' standing, being next in the line of cotton goods after the better grades of gingham. In effect it is a cloth having but one color in the warp, and woven with a white filling, this combination producing a solid color effect, the white filling having the chance of reducing any harshness of warp color in the cloth.

COMPOSITION.

Chambray is composed of one warp



and one filling, either all cotton, cotton and silk, or all silk. It is made 27 to 30 inches in width and of 1-30s cotton warp to 1-60s silk, the count of yarn being governed by the weight per yard desired. The weight per finished yard is 2 to 3½ ounces.

GOOD COLORS

for the warp are navy blue, dark brown, pink, lavender, black, nile green, etc.

This fabric is woven on any and all plain looms that will weave other light-weight cloths, the lightest running looms being the best on account of being easier on the fine warp yarns employed. It can be woven successfully on the Mutual or Fairmount, Mason, Colvin, Lowell and other roller looms.

Chambray, when made of cotton warp and filling, receives a regular gingham finish, and the loom width can be restored to the goods during the finishing by the process of tentering.

TENTERING

means the running of the goods over a machine, fitted underneath with a series of coils of steam pipe; the top of the machine is fitted with an endless chain (on either side). This chain has a row of steel needles standing erect upon its face.

These chains are adjustable. This permits of altering the space between the chains, the idea being to set the chain the width desired, and as the machine runs, pass the needles through either selvedge, and the cloth is stretched to the width desired.

To finish chambray, first run through the sprinkler, then through a solution of warm size, to stiffen the fabric. After the sizing the goods are tentered, to widen and partly dry them, then run through the cylinders to complete drying and last the calender to remove wrinkles, and to produce smooth, evenly ironed finish.

1 square inch equals 1.23 grains.

27x36 equals 973x1.23 equals 1,195.56 divided by 1 equals 1,195.56 divided by 437.5 equals 2.736 ounces per yard.

27 inches wide finished.

15 pieces light blue warp yarn x 4 inches equals 60 inches equals .58 grains—6 per cent weight size equals .5,452 grains—15 per cent take-up equals .4,635 grains.

60x7,000 equals 420,000 divided by .4,635 equals 906,148 divided by 36 equals 25,176 divided by 840 equals 1-30s warp.

30 pieces white filling yarn x 2 inches equals 60 inches equals .55 grains.

60x7,000 equals 420,000 divided by .55 equals 763,636 divided by 36 equals 21,214 divided by 840 equals 1-36s filling.

78 ends per inch finished and 60 picks per inch finished equal 72 ends in reed per inch and 56 picks in loom per inch.

6 per cent size on warp; 15 per cent take-up on warp; weaving.

1,300 reed, 2 ends per dent.

27 inches wide finished including selvedge.

78 ends x 27 inches equals 2,106 plus 32 ends white selvedge equals 2,138.

2,106 blue ends + 15% take-up = 2,477.65
 yards 1-30s warp....................... = 1.573 ozs.
32 white ends + 15% take-up = 37.65
 yards 1-30s selvedge.................... = .023 ozs.
60 picks per inch x 27 inches = 1,620
 yards 1-26s white filling................ = 1.186 ozs.
 2.782 ozs.

2.782 ounces per yard.

Carding and Spinning Particulars.

The required machines, etc., to make chambray belong to the second

division of mills as given in a previous lesson. For this class of goods a 1¼ to 1½-inch staple American cotton may be used. Mixings should be large so that the yarn will always be as uniform as possible. After being run through the bale breaker, the cotton should be passed through an opener and two processes of picking. The usual points that have already been given in connection with the picker room should be looked after and need not be repeated here. The speed of the beater on opener is 1,050 revolutions per minute, fan 350 revolutions per minute, and be sure to keep hopper on this machine at least three-fourths full of cotton all the time that the machine is working. The speed of a two-bladed rigid beater at the breaker is 1,500 revolutions per minute and the speed of the fan 1,400 revolutions per minute. The lap at this machine weighs 16 ounces to the yard or about 40 pounds for the total weight of lap. The speed of the beater at the finisher should be about 1,450 revolutions per minute and the fan 1,100 revolutions per miunte, the weight of the lap, 14 ounces, the total weight of the lap being 39 pounds. Cut roving waste is mixed in with the good waste at the finisher picker as usual. The settings of the card should be about as given in a previous lesson when the settings for mills making madium counts of yarn were given in detail. The draft of the card should be about 100 and the speed of the licker-in 300 revolutions per minute. The wire used should be No. 34 on cylinder and 35 on doffer and flats. The cards should be ground at least once a month and stripped three times a day, for this class of goods. The weight per yard of sliver should be about 65 grains and the production per week 750 pounds. The cards should be cleaned thoroughly at least twice a day and the fronts should be cleaned at least twice more; the strips should be connected four times a day at regular intervals, for if this is not done the strips are apt to get under the stripping comb and onto the flats, thus bringing up the comb and wire on to the flats. The flats should be ground at least once a month and a great deal of care should be taken with the setting of the grinding roll. because if this roll is set heavier on one side than on the other the cotton will not be evenly carded.

THREE PROCESSES OF DRAWING.

Three processes of drawing are used for this class of goods, the speed of the front roll being [illegible] revolutions per minute and the weight of the sliver at the finisher drawing should be 72 grains per yard. Production for 60 hours, 1,620 pounds per head per week. A good setting for the rolls for 1¼ inch staple would be as follows: 1½ inches between front and second rolls, 1⅝ inches between second and third rolls and 1¾ inches between third and back rolls. The slubber rolls are read as follows: Front roll to middle roll 1⅜ inches; middle to back roll 1½ inches. The slubber makes the sliver into a .55 hank roving. The hank roving at the first intermediate is 2.00 and fine frame 6.00 hank. Keep the bunches out of the roving as much as possible and change the top leather rolls frequently. Watch all your frames to see that no one frame is making too much bad work either by a poor hand or through the machine not being properly regulated. The 6.00 hank roving is taken to the spinning room and spun into 30s yarn. To do this, the following is given as the best equipped frame: For filling for 30s yarn most any high grade spindle may be used and good results obtained; gauge of frame 2¾ inches; diameter of ring 1⅜ inches; length of traverse 6 inches and twist per inch 19.17. For 30s warp yarn, gauge of frame 2¾ inches; diameter of ring 1⅝ inches; length of traverse 6½ inches; twist per inch 26.02.

A good size that may be used at the slasher for this class of goods is as follows: Water, 100 gallons; corn starch, 50 pounds; tallow, 3 pounds; turpentine, 1 gill; boil 30 minutes.

Dyeing Particulars.

RED.

3½ per cent benzo fast red G L; 1 per cent chrysophenine; 30 per cent Glauber's; 2 per cent sal soda.

LAVENDER.

¼ per cent benzo fast violet R; 2 ounces benzo fast blue B N; 30 per cent Glauber's; 2 per cent sal soda.

NILE GREEN.

5 per cent katigen green 2 B; 5 per cent sulphide sodium; 2 per cent soda; 20 per cent Glauber's.

PINK.

5 per cent diamine rose, B D; 30 per cent Glauber's; 2 per cent sal soda.

OLIVE.

3 per cent immedial olive B; ½ per

cent immedial black N B; 1 per cent immedial brown B; 30 per cent Glauber's; 4 per cent sodium sulphide; 2 per cent soda.

BLACK.

15 per cent immedial black N N; 15 per cent sulphide sodium; 30 per cent Glauber's; 3 per cent soda.

NAVY BLUE.

4 per cent immedial indone B; 5 per cent immedial indone R; 9 per cent sodium sulphide; 30 per cent Glauber s; 3 per cent soda.

DARK BROWN.

15 per cent tetrazo sulphur brown B; 1 per cent tetrazo sulphur black; 16 per cent sodium sulphide; 30 per cent Glauber's salt; 3 per cent soda.

DARK SLATE.

2 per cent immedial black N B; 2 per cent immedial direct blue B; ¼ per cent immedial yellow D; 30 per cent Glauber's salt; 3 per cent soda; 5 per cent sulphide soda.

DARK GREEN.

8 per cent immedial dark green B; 1 per cent immedial yellow D; 10 per cent sodium sulphide; 30 per cent Glauber's; 3 per cent soda.

LIGHT BROWN.

3 per cent thion brown G; 3 per cent sodium sulphide; 1 per cent soda; 20 per cent G·auber's.

Finishing Particulars for Chambrays.

STARCH.

¾ pound corn starch; 1 gallon water, mix cold, and boil ½ hour; dry on cans and give a light calender.

CANTON FLANNEL.

Canton flannel is a narrow, heavy, all-cotton fabric, having a twill effect on one side of the cloth and a long, soft nap on the other side. It is always made with one warp and one filling. The weave generally is a $\frac{1}{3}$ twill for the winter weights, and $\frac{1}{2}$ twill for summer weight. The warp is composed of regular cotton yarns to which a very small percentage of size has been added, say 2 or 3 per cent, just sufficient to allow the yarn to withstand the operation of weaving. The filling is spun from a good grade of cotton, and is made with a slack twist to enable it to nap more readily, as this portion of the cloth is that which gives the fabric its one distinguishing feature.

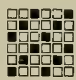
THE TWILL WEAVE

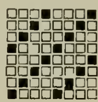
is used in the construction of this fabric, because it permits of long regular floats in the filling effect of the weave, and these floats present an excellent surface from which to raise a nap. The other side of the cloth, being the warp effect of the twill weave, serves to create the diagonal rib or twill lines.

These goods are made to sell at 27 to 30 inches in width, at about 5¼ ounces, winter weight, composed of 1-10s to 1-6s warp and filling; also 3¼ ounces, summer weight, composed of 1-20s to 1-14s warp and filling, the heavy, coarse yarn in each instance being the filling.

Canton flannel can be woven on any single box-plain loom.

Summer weight three ounces.





Winter weight five ounces.

The nap is raised on the cloth by running the goods through a machine built especially for this purpose. The machine consists of an iron frame having a series of rollers set within it, and over these rollers the cloth passes. The napping itself is done by a roller similar to a fancy on a woolen card. The cloth in passing over the wooden rollers at length passes between the wire toothed roller and a wooden roller. The cloth is being drawn through the machine automatically in one direction, and the wire-toothed roller revolves in the opposite direction, and being set for a nap of desired height or loftiness, the wire, coming in contact with the soft filling yarn, brushes the fibre in such a manner as to cause it to stand out from the body of the filling thread, hence the nap.

Canton flannel is taken direct from the loom, measured, napped and folded; then is ready to pack and ship.

CANTON FLANNEL.

4 square inches equals 9.25 grains. 27¼ inches selling width. 27¼ x 36 equals 981 x 9.25 equals 9,074.25 divided by 4 equals 2,268.56 divided

by 437.5 equals 5.185 ounces per yard. 27¼ inches finished.

15 pieces warp x 3 inches equals 45 inches equals 1.14 grains.

45 x 7,000 equals 315,000 divided by 1.14 equals 276,315.78 divided by 36 equals 7,675.44 divided by 840 equals 9.14 or 1-10s cotton warp.

8 pieces filling x 5 inches equals 40 inches equals 1.18 grains.

40 x 7,000 equals 280,000 divided by 1.18 equals 237,288.13 divided by 36 equals 6,591.33 divided by 840 equals 7.84 or 1-8s cotton filling.

CONSTRUCTION.

Reed 540 — 30 3-5 inches, including selvedge of 32 ends, 4 ends per dent. 5 per cent take-up in weaving.

68 ends per inch finished and 48 picks per inch finished equals 60 ends per inch in loom and 44 picks per inch in loom. $\frac{3}{\;\;1}$ 45s twill weave. 1-10s cotton warp. 1-8s cotton filling.

68 ends per inch x 27 equals 1,836 plus 32 equals 1,868 ends plus 5 per cent take-up equals 1,956 yards of 1-10s cotton warp equals 3.725 ounces.

48 picks x 27¼ equals 1,308 yards. 1-8s cotton filling equals 3.114 ounces.

3.725	ounces warp.
3.114	ounces filling.
6.839	ounces from loom.

6.839	ounces loom.
5.185	ounces finished.
1.654	ounces loss in napping.

Carding and Spinning Particulars.

Canton flannel, or rather the counts of yarns to make this class of cloth, consists of a low grade of cotton of about three-fourths to one inch in staple, and the mills making Canton flannel belong to the first division of mills. The bales of raw stock are not sorted out as carefully as is the custom when fine yarns are to be made, but all the bales should be stamped to get the length of staple as near uniform as possible. Larger mixings are used for this class of goods than when fine goods are being made, because more cotton is used, due to a larger production being turned off at each process. The cotton is sometimes passed through a bale breaker, but more often is

MIXED BY HAND,

i. e., taken from the bale and broken into small bunches and thrown directly into the mixing bin. The cotton is allowed to stand as long as possible to dry out and is then put through the opener. In some mills the waste from the comber and card is put into the mixings in very small proportions, but more generally only the good waste is put in. The speed of the beater should be 1,050 revolutions per minute, it being remembered that the lower grades of cotton are dirtier than the higher grades and longer stapled cotton. It may seem strange to some of our readers that the speed of the beater of the opener is 1,050 revolutions per minutes for both low, medium and even high grades of cotton, but it must be remembered that the staples of the cottons differ and the speed of the beater really is based on so many blows or beats per minute; so that cotton having a staple of three-fourths an inch receives twice as many beats per inch as cotton one and one-half inches in length, all other conditions remaining the same. The above not only applies to the beaters on the openers, but also to all the pickers. In these lessons it is taken for granted that a two-bladed beater of the ridged type is used, and for a three-bladed beater, the speed should be less, or as two is to three. Special speeds should be used for other makes of beaters, such as the vertical beater, porcupine beater and Kirschner beaters. Two processes of picking are used. The weight per yard of lap is 40 pounds or 16 ounces to the yard. The speed of the finisher beater is 1,450 revolutions per minute, and the finished lap weighs 39 pounds or 14½ ounces to the yard. The bars under the beaters should not be too close together so that the dirt and foreign matter in the cotton cannot drop through into the waste recepticle after it has been separated from the cotton and the dirt, etc., should be thus removed at regular intervals so as not to choke these beater bars and thus allow the dirt to pass through with the good cotton. This class of goods should be carded on coarse wire. The

DRAFT OF THE CARD

should not exceed 100, and a draft of 90 is much better as the stock will be handled better. The speed of the beater should be 300 revolutions per minute and a 26-inch diameter doffer should be used when possible. The production of the card should be from 900 to 1,000 pounds of sliver per week of 60 hours. Two processes of drawing are used, the speed of the front roll at each being 400 revolutions per minute, the weight of the sliver at the finisher being 70 grains per yard, six ends being put up at the back. The hank roving made at the slubber should be about .50, or, say, .55. This is made into 1.00 hand at the first intermediate and into a 4.00 roving at the second intermediate. The 1.00 hank roving is spun

into a soft twisted 6-count cotton yarn in the spinning room, and the 4.00 is made into 20s soft twist yarn. A warp frame to make 6s should have the following particulars: Gauge of frame 3 inches, diameter of ring 2¼ inches, length of traverse 7 inches, or even more than this length may be used. For a filling frame for 20s, use 2¾-inch gauge of frame, 1½ inch diameter of ring and 6½ inches length of traverse. Remember that this class of goods requires a soft twist.

Dyeing Particulars.

The pieces are run through the napping machines and the fibre well raised, before the dyeing operation.

The pieces are dyed in the jig machine, or continuous dyeing machine, where the pieces are run over rollers, 6-10 times through the dyeing liquor, and then passed through two squeeze rollers. In the continuous machine the nap is not laid as much as in the jig.

The colors generally dyed are one dip direct colors, bright shades being mostly called for.

LIGHT BLUE.

One per cent tetrazo sky blue; 20 per cent Glauber's; 1 per cent sal soda.

LIGHT BROWN.

Two per cent tetrazo brown B; ½ per cent tetrazo yellow D; 25 per cent Glauber's; 1 per cent sal soda.

PINK.

One-half per cent diamine rose B D; 15 per cent Glauber's; 1 per cent sal soda.

RED.

Four per cent benzo purpurine 4 B; 30 per cent Glauber's; 3 per cent sal soda.

HELIOTROPE.

One-half per cent benzo fast violet R; ¼ per cent benzo fast blue B N; 20 per cent Glauber's; 2 per cent sal soda.

GREEN.

Three per cent diamine green G; ½ per cent diamine fast yellow B; 30 per cent Glauber's; 3 per cent sal soda.

SCARLET.

Four per cent diamine scarlet B; 30 per cent Glauber's; 3 per cent sal soda.

OLIVE.

Two per cent benzo dark green G G; 2 per cent chrysophenine; 30 per cent Glauber's; 3 per cent sal soda.

ORANGE.

Two per cent benzo fast orange S; 30 per cent Glauber's; 3 per cent sal soda.

BLUE.

Four per cent diamine brilliant blue G; 30 per cent Glauber's; 3 per cent sal soda.

ECRU.

One-quarter per cent immedial yellow D: ¼ per cent immedial cutch G; 2 per cent sodium sulphide; 2 per cent soda; 20 per cent Glauber's salt.

SLATE.

One-half per cent benzo fast black; ½ per cent benzo fast blue B N; 30 per cent Glauber's salt; 2 per cent sal soda.

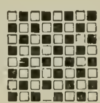
MAROON.

Three per cent diamine fast red F; 1 per cent diamine bordeaux B; 30 per cent Glauber's; 3 per cent sal soda.

When the pieces are dyed, well rinsed and dryed, they are run through the napping machine to finish the goods and raise the fibres.

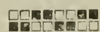
DUCK.

Duck is a heavy weight, single cloth fabric, made from all-cotton yarns. But one warp and one filling are necessary and these are usually of coarse, two-ply yarns woven into a cloth hav-



Design

Drawing-in Draft



Reed Plan

ing a high texture. Duck has a stiff, hard feel, which fact imparts to it the splendid wearing qualities for which it is popularly known as a staple material. It is used principally in the manufacture of sails, tents, car curtains, etc., or for any other purpose, requiring a good water-tight fabric, which will withstand rough usage. Duck is made

IN A VARIETY OF GRADES

weighing from 7 ounces to the yard, 27 inches wide, to 25¼ ounces per yard, 60 inches wide. The lighter weights in this fabric are used extensively for awnings. These goods are either stripes or solid colors and are never plaided.

The majority of these goods are made all white.

Nearly all known textile colors are at times used in making color effects in this line, the most popular being dark brown and white, indigo blue and white, tan and white, tan and white twist and tan; all of which are fast colors.

Duck, being a hard, stiff fabric, caused by using coarse yarn at high texture, necessitates the use of

A HEAVIER LOOM

than that used for an ordinary cloth. The duck loom was built for this very purpose, and is entirely satisfactory, as it is a plain, single box cam loom, each part being heavier than its corresponding part in an ordinary light running plain loom.

Duck is made also in light weights for use as an outing trousering for men in solid black; also in pale blue, ecru, pink, etc., for ladies' shirtwaist suits.

To finish this fabric, it is taken from the loom and measured, then washed and sized, then dried and pressed.

If a fancy, solid color is desired, the goods are dyed in the piece after the first washing.

DUCK (AWNING STRIPE).

4 square inches equals 11.7 grains. 31 inches wide finished.

31 x 36 equals 1,116 x 11.7 equals 1,305.72 divided by 4 equals 3,264.3 divided by 437.5 equals 7.461 ounces per yard, 31 inches wide.

15 pieces tan warp yarn x 2½ inches equals 37½ inches equals 1.6 grains. 37½ x 7,000 equals 262,500 divided by 1.6 equals 164,062 divided by 36 equals 4,557 divided by 840 equals 2-12s cotton.

7 pieces tan filling yarn x 2½ inches equals 17½ inches equals .2 grains. 17½ x 7,000 equals 122,500 divided by 2 equals 6,125,000 divided by 36 equals 17,013 divided by 840 equals 1-20s cotton.

CONSTRUCTION.

Reed 900—2 ends per dent, 31 inches finished width. 20 per cent take-up in weaving.

52 ends per inch finished and 38 picks per inch finished equals 50 ends per inch reed and 36 picks per inch loom.

52 x 31 = 1,612 ends + 20 per cent take-up = 2,015 yards 2-12s warp............... = 6.396 oz.
38 x 31 = 1,178 yards 1-20s filling........ = 1.121 oz.
7.517 oz.

Warp pattern: fancy colored (broad) stripes, plain weave $\frac{1}{1}$.

(HEAVY) DUCK (ARMY).

4 square inches equals 17.2 grains. 28½ inches finished width. 28½ x 36 equals 1,026 x 17.2 equals 17,647.2 divided by 4 equals 4,411.8 divided by 437.5 equals 10.08 ounces per yard.

17 pieces warp yarn x 2½ inches equals 42½ inches equals 2.4 grains. 42½ x 7,000 equals 297,500 divided by 2.4 equals 123,958.3 divided by 36 equals 3,443.3 divided by 840 equals ¼ or 3-12s cotton.

10 pieces filling yarn x 2 inches equals 20 inches equals .5 grains. 20 x 7,000 equals 140,000 divided by .5 equals 2,800,000 divided by 36 equals 77,777 divided by 840 equals 1-9 or 2-18s cotton.

CONSTRUCTION.

Reed 800—2 ends per dent, 28½ inches finished width, 31 inches in reed, 29 picks per inch filling. 20 per cent equals take-up in weaving, shrinkage in length finishing. 8 per cent equals contraction in width in weaving.

48 ends per inch finished and 32 picks per inch finished equals 44 ends per inch reed and 29 picks per inch loom.

48 ends per inch x 28½ inches = 1,368 ends + 20% = 1,710 yards 3-12.............. = 8.14 oz.
32 picks per inch x 28½ inches = 912 yards 2-18 .... = 1,93 oz.
10.07 oz.

Plain weave $\frac{1}{1}$

(HEAVY) DUCK (CAR CURTAINS).

Reed 800—2 ends per dent, 20 per cent take-up in weaving.

48 ends per inch finished and 29 picks per inch finished equals 44 ends per inch in reed and 26 picks per inch in loom.

38 inches wide finished equals 16 ounces per yard.

2-8s cotton warp and filling, 50 inches wide, equals 21 ounces.

Warp stripe patterns, 60 inches wide, equals 25¼ ounces.

Filling all white, plain weave.

Carding and Spinning Particulars.

Duck is made from various grades of raw cotton, according to the use to which it is going to be applied. Even Sea Island cotton of the longest staple has been used to make duck cloth, but this is the exception rather than the rule. When the longer and higher grades of raw stock are used, the cloth made is generally used for sail, and the Sea Island cotton was used to make into duck for one of the yachts which raced for the international cup. For the average use, however,

THE STOCK USED

is of about one inch staple and of a medium low grade of cotton. The class of mills making duck belongs to the first division of mills as given in a previous lesson. The cotton is put through a bale breaker and from here is passed on to the mixing bin. At this bin good waste is mixed in, and sometimes, in the lower classes of ducking, comber waste and card waste are mixed in in small quantities. When waste is mixed with raw stock, it is mixed in certain fixed proportions, and should not be done in a haphazard

way, because waste always makes the mixture give more or less trouble while in the earlier processes of handling than is the case when cotton is used by itself. The cotton, after being mixed, is allowed to stand as long as possible before using, for reasons already given in previous lessons, and then is run through an opener and two processes of picks. As the lower grades of cotton are generally dirtier than the higher grades, a

HIGHER SPEED OF THE BEATER IS REQUIRED,

so that the speed of the opener should be about 1,100 revolutions per minute, while the speed of the breaker picker should be at least 1,500 revolutions per minute, while the speed of the beater of the finisher picker should be 1,450 revolutions per minute, or about 42 beats per inch of stock.

The lap at the breakers should weigh at least 40 pounds or 16 ounces to the yard, while at the finisher picker the lap should weigh 39 pounds or about 15 ounces to the yard. If waste is used in the mixture, generally a great deal of trouble is found from what is called licking, i. e., where the lap does not unroll as it should, but layers adhere to one another. If the lap is not fixed it will be seen that

UNEVEN YARN WILL RESULT.

There are various causes for laps licking, two of the principal ones being the presence of too much waste in the mixture, the remedy for which is obvious; and second, that the current of air in the picker is not properly directed so that the greater part, if not all the cotton, after it has passed the beater, is not blown as it should be onto the top cage, but the air is so directed that the cotton falls on both cages and a split in the lap is bound to occur and cause licking at the next process. Licking is always the cause of a great deal of trouble and should be stopped as quickly as possible. The lap is passed onto the card, which, for this class of goods, is provided with a heavy wire. The

DRAFT OF THE CARD

should be about 90 to 100. The sliver should weigh at least 65 grains to the yard and the production should be as large as possible, a good average ranging from 900 to 1,000 pounds per week. Cards should be stripped on this class of goods three times a day, and some overseers advocate four times a day, but this extra stripping is to be questioned as to advisability. The speed of the licker-in for this class of goods is 300 revolutions per minute. The cotton sliver is passed through three processes of drawing, the weight of the finished slivers being 70 grains. From here it is passed to the slubber and made into .55 hank roving. From here it is passed through the first intermediate and made into 1.10 hank, and onto the second intermediate and made into 3.00 hank. From here it is passed to the spinning room. For awning stripes, this three hank roving is made into 12s warp and 20s filling, and for coarser ducking into 12s warp and 18s filling. Good specifications for a filling ring frame are as follows: Gauge of frame, 2¾ inches; diameter of ring, 1⅝ inches; length of traverse, 6½ inches; and for a warp ring frame, gauge of frame, 3 inches; diameter of ring, 2⅛ inches; traverse, 7 inches. The yarn is then taken to the twister and doubled as required.

Dyeing Particulars.

FOR AWNING DUCKS.

As the colors for this fabric must be fast as possible to sunlight and rain, so the color will not fade, or run into the white stripes, only absolutely fast colors are dyed. The yarn is generally dyed in the warp.

INDIGO BLUE.

Indigo blue has been dyed for these goods until recently, but immedial blues have been found to withstand exposure even better than indigo.

Four and one-half per cent immedial indone B; 4½ per cent immedial indone R; 9 per cent sulphide sodium; 3 per cent soda, and 30 per cent Glauber's.

TURKEY RED.

First, mordant with a solution of alizarine oil, 10 per cent; squeeze and dry; heat of bath 200 degrees F.

Second, pass through acetate of alumina at 8 degrees Tw.; dry in hot air.

Third, dung with cow dung and chalk, at 120 degrees Tw., and rinse.

Fourth, dye with 10 per cent alizarine, 20 per cent, 2 per cent alizarine oil, ¼ per cent tannic acid; get up to boil in 45 minutes; boil one hour.

Fifth, dry without washing and oil 5 per cent alizarine oil; dry.

Sixth, steam in steaming box one hour.

Seventh, soap in three clean baths till warps are clean.

BUFF.

Pass through solution 10 gallons water, one pint nitrate iron, 33 degrees Tw., squeeze, pass through solution 10 gallons water, one pint caustic soda,

and rinse. Repeat operation till shade is dark enough; rinse well.

CHROME YELLOW.

Pass through solution 10 gallons water, one pound white sugar lead, squeeze, pass through solution 10 gallons water, one pound bichrome, four pounds common salt; rinse well.

CHROME ORANGE.

Pass through solution of sugar lead, 24 degrees Tw., squeeze. Pass througn hot lime water, squeeze, chrome, two ounces to gallon boiling, squeeze; run through hot lime water and rinse.

LIGHT BROWN.

Four per cent immedial cutch C; 4 per cent immedial brown B; 8 per cent sulphide soda; 3 per cent soda; 30 per cent Glauber's; rinse, after treated to make color much faster: 2 per cent blue stone; 2 per cent chrome; 3 per cent acetic acid; rinse and soap.

DARK BROWN.

Six per cent immedial cutch G; 6 per cent immedial brown B; ¼ per cent immedial black N R; 10 per cent sulphide sodium; 3 per cent soda; 30 per cent Glauber's; rinse, after treat: 2 per cent blue stone; 2 per cent chrome; 3 per cent acetic acid; rinse and soap.

MAROON.

Six per cent immedial maroon B; 6 per cent sulphide sodium; 3 per cent soda; 30 per cent Glauber's; rinse, after treat: 1 per cent blue stone; 1 per cent chrome; 3 per cent acetic acid; rinse and soap.

LIGHT GREEN.

Three per cent immedial indone B; 2 per cent immedial yellow D; 5 per cent sulphide sodium; 3 per cent soda; 25 per cent Glauber's; after treat; 3 per cent blue stone; 3 per cent chrome; 3 per cent acetic acid.

DARK GREEN.

Eight per cent katigen indigo B; 4 per cent katigen chrome brown 5 G; 8 per cent sulphide sodium; 3 per cent soda; 25 per cent Glauber's; after treat: 3 per cent blue stone; 3 per cent chrome; 3 per cent acetic acid; rinse and soap.

BLACK.

Fifteen per cent immedial black N N; 13 per cent sodium sulphide; 3 per cent soda; 30 per cent Glauber's; rinse, after treat: 3 per cent blue stone; 3 per cent chrome; 3 per cent acetic acid; rinse and soap.

DARK SLATE.

Three per cent immedial black V Ex.; 3 per cent sodum sulphide; 2 per cent soda; 20 per cent Glauber's; rinse, after treat: 1 per cent blue stone; 1 per cent chrome; 2 per cent acetic acid; rinse and soap.

ARMY DUCK.

Army duck has been always dyed the old, reliable cutch and chrome brown. First, pass through a boiling solution of cutch logwood and fustic or cutch alone, and then through solution of boiling chrome and sometimes a weak solution of nitrate of iron for after treatment; rinse and soap.

Army duck can be dyed with sulphur colors: 5 per cent immedial cutch O; 1 per cent immedial brown R R; rinse and treat: 1½ per cent blue stone; 2 per cent chrome; rinse and soap.

STRIPES—HICKORY STRIPES.

This is an all cotton light-weight fabric, averaging about five ounces per yard finished. In appearance it resembles ticking, although it is of lower texture and has a softer feel, due to the process of finishing. It is always woven with a $\frac{2}{\ \ 1}$ regular 45 degrees right-hand twill (warp effect) and in two colors, blue and white or brown and white in the warp and all white filling, thus forming warp stripe patterns.

It is used in the rural mountain districts of a few of the middle and southern states as a material for men's pants and shirts, as these two garments constitute about all the clothing necessary in such sections for most all seasons of the year. It is

A TOUGH PLIABLE FABRIC,

having good wearing qualities and on the principle of economy is well adapted to the needs of the poorer white laboring class of the South.

This fabric is made of regular cotton yarns, 1-14s and 1-16s warp and filling, and is woven to finish about 27 inches in width.

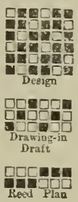
It can be woven on any plain loom and is usually drawn in on cotton harness, as these are

cheaper, in the estimation of the southern cotton manufacturer, as he can use up old stock in the spinning of cotton harness cord, and in this manner, to a certain extent, create a by-product as against the cost of equipping the plant with wire heddles and other necessary findings—harness rods, frames, etc.

To finish hickory stripe, the cloth is taken from the loom and measured, then it is sheared, sized and pressed, it is then rolled or lapped and is ready to pack and ship.

CONSTRUCTION.

Four square inches equals 9.25 grain. 27x36 equals 972x92 equals 8,991.00



divided by 4 equals 2,247.75 divided by 437.5 equals 5.137 ounces per yard.

15 pieces blue warp yarn times 4 inches equals 60 inches equals one grain. 60x7,000 equals 420,000 divided by .1 equals 4,200,000 divided by 36 equals 116.666 divided by 840 equals 1-14s cotton. 15 pieces white warp yarn times 4 inches equals 60 inches equals .1 grain. 15 pieces white filling yarn times 4 inches equals 60 inches equals .9 grains. 60x7,000 equals 420,000 divided by .9 equals 466,666 divided by 36

10% contraction in width in weaving.
5% take-up in length in weaving.
6 2-3% shrinkage in length in finishing.
6% size on warp.

Warp pattern.
6 Blue.
3 White.
3 Blue.
3 White.

15 ends per repeat.

equals 12,962.96 divided by 840 equals 1-14s cotton.

Reed 800—3 ends per dent, 30 inches in reed, including selvedge. 27 inches finished. Filling — all white. 74 ends per inch finished and 60 picks per inch finished equals 66 ends per inch loom, 56 picks per inch loom.

74 ends per inch times 27 inches equals 1,998 ends plus 24 selvedge equals 2,022 ends; 1,998 divided by 15 equals 133 repeats plus 3 ends.

9 blue ends per pattern times 133 equals 1,197 plus 3 equals 1,200 blue ends. 6 white ends per pattern times 133 equals 798 white ends, 24 white ends selvedge.

1,200 blue ends + 5% take-up = 1,263 yards 1-14 cot. =..........1,718 ozs.
798 white ends + 5% take-up = 840 yards 1-14 cot. =.................1.142 ozs.
24 white selvedge = 25.26 yards 1-14 cot. =......................... .034 ozs.
56 picks white filling x 30 = 1,680 yards 1-14 cot. =................2.285 ozs.

5.179 ozs. per yd.

Finish equals sizing and pressing weave $\frac{2}{1}$ warp effect 45 degrees twill.

Dyeing Particulars.

BLUE.

Dye in the warp—1½ per cent immedial indone 3B, 4 per cent immedial indone B, 4 per cent sodium sulphide, 3 per cent soda, 30 per cent Glauber's, rinse well.

DARK SLATE.

4 per cent immedial black NR, 4 per cent sodium sulphide, 3 per cent soda, 20 per cent Glauber's, rinse well.

BLACK.

1 per cent katigen black S W, 15 per cent sodium sulphide, 3 per cent soda, 30 per cent Glauber's, rinse well.

DARK BROWN.

15 per cent katigen brown V, 15 per cent sulphide sodium, 3 per cent soda, 30 per cent Glauber's, rinse well; starching, one gallon water, one-half pound cornstarch, mix cold, boil one hour, run through starch mangle and dry, give a light calendering.

TICKING.

Ticking is a single cloth, of either medium or heavy weight, and is composed of single cotton yarns from 1-14s to 1-22s in warp and filling or combination of both, such as 18s warp and 20 filling. It is a good, stout cloth, having fine wearing qualities, and is used principally for making bed ticks and pillow and bolster cases. It is generally made with what is known as a bed-tick weave or $\frac{2}{1}$ or $\frac{3}{1}$ twill, either right or left handed 45s twill broken or herring-bone. It can be woven in any power loom, but is best

adapted to and most always woven in the

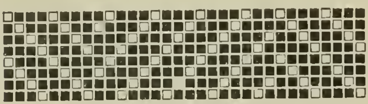
PLAIN SINGLE BOX LOOMS.

Ticking belongs to the family of stiff, hard face cotton fabrics. This feature is created by using twill weaves (warp effect), and these weaves permit of the use of a more than ordinary high warp texture. For instance, take $\frac{3}{1}$ twill: In this weave there are interlacings of each warp thread in every four picks of filling, thus allowing ends to lie closely together—hence permitting an increase in ends per inch.

These goods are usually made in two colored warp patterns—dark blue and white, red and white.

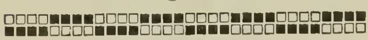
WHITE FILLING IS USED IN ALL CASES.

Fast colors should be used in warp as bed-ticks are sometimes ripped



Design and Weave.

Drawing-in Draft.



Reed Plan.

open and the cloth washed. In this case the light and air renew the coloring on the yarns.

Ticking is woven with from 60 to 84 ends and picks per inch in the loom, according to grade required. The greater the number of warp threads the stouter the fabric in proportion to counts of yarns used.

To finish these goods, they are brushed and sheared to remove all lumps and foreign substances from the face of the cloth. Then the cloth is sized and calendered, which acts in the same manner as a hot press, after which the cloth is lapped or rolled into bolts, then stitched, and is ready to pack and ship.

CONSTRUCTION OF TICKING.

Reed 725—33 inches, 4 ends per dent. 1-16s warp, 1-20s filling, 74 picks; 12½ per cent take-up in weaving; 10 per cent size on warp, 7 per cent size of cloth in finish; $\frac{3}{1}$ herring-bone twill weave; finish equals 31½ inches, and includes brushing, shearing, sizing and calendering.

WARP PATTERN.

16 White.
2 Blue.
2 White.
8 Blue.
2 White.
2 Blue.
1 square in. = 2.9 grains.

31½ times 36 equals 1,134 square inches times 2.9 equals 3,288.6 grains divided by 437.5 equals 7.51 ounces.

18 piece warp yarn, 2 inches equals 36 inches equals .55 grains; 36 x 7,000 equals 252,000 divided by .55 equals 45,818 divided by 36 equals 12,727 divided by 840 equals 1-16s warp yarn.

20 pieces filling yarn 1½ in. equals 30 inches equals .34 grains.

30 x 7,000 equals 210,000 divided by .34 equals 617,644 divided by 36 equals 17,156 divided by 840 equals 1-20s filling yarn.

92 ends per inch finished equals 86 in reed.

78 picks per inch finished equals 74 in loom.

92 x 31½ equals 2,898 plus 24 equals 2,922 ends.

1,473 ends white equals 12½ per cent take-up equals 1,683 yards.

1-16s cotton warp equals 2 ounces.

1,449 ends blue equals 12½ per cent take-up equals 1,656 yards.

1-16s cotton warp equals 1.97 ounces plus 22 per cent increase by dyeing equals 2.22 ounces.

White warp yarn equals 2 ounces plus blue warp yarn equals 4.22 ounces plus 10 per cent size equals 4.64 ounces.

78 picks x 31½ equals 2,457 yards 1-20s filling equals 2.34 ounces.

Warp weight equals 4.64 ounces plus filling weight equals 2.34 ounces plus 7 per cent size in finishing equals 7.50.

Carding and Spinning Particulars.

The yarns used in ticking are made in mills of the first division as given in a previous article. The length of the raw stock used varies in different mills according to the grade of ticking to be made, but is generally ⅞ to 1⅛ inches in length. This does not mean that raw stock of from ⅞ to 1⅛ inches is used in the same mixing, but that the mixing is made up of stock of uniform length.

THE MIXINGS

for this class of goods are generally made by hand and the bins should be made as large as possible so as to accommodate large mixings. It would be better to have two large bins instead of one, so that one lot of raw stock could be opened and dried out

while feeding the machines from the other bin. On this class of goods comber waste is used in some mills and the cut roving waste is also mixed as has been before stated. An opener and

TWO PROCESSES OF PICKING

are used and the lap should be made as heavy as possible without, of course, making it so heavy that it will bring up the cards and finisher picker. Keep the hopper of the opener as full as possible and you will find that an evener lap will be made. The speed of the fan of the opener should be 1,100 revolutions per minute. The speed of the beater (of a two-bladed, rigid type) should be at least 15,000 revolutions per minute, and the weight of lap about 40 pounds or 20 ounces in weight per yard. The lap is put up at the breaker and doubled four into one and delivered so as to weigh 14½ ounces per yard or about 39 pounds for the whole lap. The

SPEED OF THE BEATER

on this machine should be 1,450 revolutions per minute. The beats per inch that the cotton would receive would be about 42. See that all your drafts on the picker are properly regulated so that a lap will be obtained that will not split. Of course, this is not the only reason that makes a lap split, but it is one of the principal ones. Another cause for split laps is found in putting too much waste in the mixing. The lap is then put up at the card which should be provided with coarse wire fillet. The

DRAFT OF THE CARD

should not exceed 100. The weight of the sliver should be about 65 grains per yard and the production about 1,000 pounds per week of 60 hours. The cards should be ground at least once every month, having the grinding rollers on for at least a half a day. Of course, grinding means loss of production, but it has to be done; otherwise, bad work will result, and if you keep your wire sharp you will find that you will have less trouble with your cards and a great deal less kicking on account of poor work.

THE SETTINGS

that should be used for this class of goods have been given in a previous lesson. The card sliver should be put through two processes of drawing, the sliver weighing 75 grains per yard at the finisher-drawing frame. Remember to never draw more than you double. The sliver is passed through the slubber and the hank roving should be about .40. Set the rolls for ⅞-inch stock on this machine as follows: Front to middle, 1⅛ inches; middle to back, 2 inches. Two processes of fly frames should be used, the hank roving being made at the first intermediate about 1.40, and at the second from 3 to 3.40.

THE SPINNING.

This roving is then taken to the spinning room where it is spun into the required count. For 16s the following would be a good equipment for a warp frame: gauge of spindle, three inches; diameter of ring, two inches; length of traverse, seven inches; and for a filling frame: gauge of spindle, 2¾ inches; diameter of ring, 1½ inches, and length of traverse, from 6½ to 6¾ inches, according to twist put in; the more twist the more length of traverse may be used. The production for a spinning frame for 16s, with the speed of front roll 139 revolutions per minute, twist 19 and revolutions of spindles 8,300, would be about 3.15 pounds per spindle per week. For a filling frame for 16s, with front roll speed of 159 revolutions per minute, twist, per inch 13, speed of spindles 6,500 revolutions per minute, the production would be about 3.34 pounds per spindle per week.

Dyeing Particulars.

Formerly ticking had only blue stripes dyed indigo blue. For some time a variety of colors have been introduced, and now many colors are used, some with narrow stripes mixed with broad stripes, having from three to five or more different colors in the same pattern.

BLUE.

Dyed with indigo or one of the sulphur blues.

Eight per cent pyrogene indigo; 8 per cent sulphide sodium; 3 per cent soda ash; 20 per cent common salt.

This color can be aftertreated with 1½ per cent chrome; 1½ per cent copper sulphate; 3 per cent acetic acid, 125 degrees F.

ECRU.

One-quarter per cent tetrazo cutch brown; ⅛ per cent tetrazo black N; 2 per cent soda; 20 per cent Glauber's salt.

LIGHT BROWN.

Three per cent Thion brown G; 2

per cent soda; 3 per cent sulphide soda; 20 per cent Glauber's salt.

LIGHT SLATE.

Three-fourths per cent Thion black B; 1½ per cent sal soda; 1 per cent sulphide soda; 10 per cent Glauber's salt.

RED.

Three per cent tetrazo red, 4 B; 2 per cent sal soda; 20 per cent Glauber's salt.

DARK BROWN.

One and one-quarter per cent Thion black B; 5 per cent Thion brown G; 3 per cent sal soda; 6 per cent sulphide soda; 20 per cent Glauber's salt.

LIGHT BRONZE.

One-quarter per cent tetrazo chlorine yellow G G; ¼ per cent tetrazo black N; ¼ per cent tetrazo brown R; 1 per cent sal soda; 20 per cent Glauber's salt.

DRAB.

One-eighth per cent benzo fast black; ¼ per cent chloramine yellow M; 1-16 per cent benzo fast red G L.

LIGHT OLIVE.

One-half per cent benzo dark green G G; ½ per cent chrysophenine.

DARK OLIVE.

Four per cent benzo dark green G G; 2 per cent chrysophenine. The above three colors are each dyed with 20 per cent Glauber's salt and 2 per cent sal soda.

DARK SLATE.

Two and one-quarter per cent benzo fast black; ⅛ per cent benzo fast blue B N; 2 per cent sal soda; 20 per cent Glauber's salt.

WINE.

Four per cent benzo fast scarlet 8 B S; 1 per cent benzo fast violet R; 2 per cent sal soda; 20 per cent Glauber's salt.

LIGHT FAWN.

One-half per cent diamine brown M; ⅛ per cent diamine brown 3 G; 2 per cent sal soda; 20 per cent Glauber's salt.

STEEL.

One-half per cent diamine steel blue L; ½ per cent diamine black B H; ¼ per cent diamine fast yellow B; 2 per cent sal soda; 20 per cent Glauber's salt.

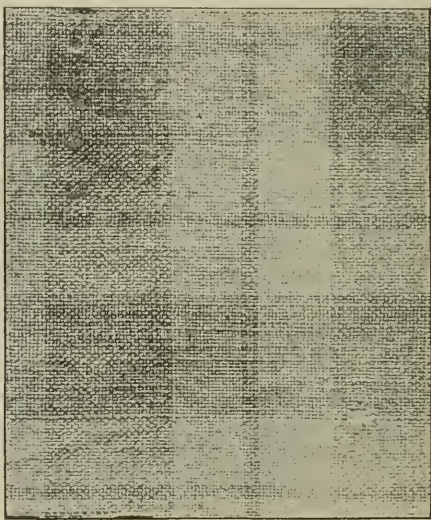
OSNABURG.

Osnaburg is a coarse single cloth composed of all cotton yarns, 1-16s, 1-18s, 1-20s, warp and filling, and is made in warp stripe patterns and in checks, the colors invariably being indigo blue and white or dark brown and white.

It is manufactured into overalls and jumpers or mock shirts, and is used in the South by the colored farm and plantation laborers. It is a strong fabric, having

EXCELLENT WEARING QUALITIES,

and is especially adapted to any purpose wherein it must sustain rough usage. It is occasionally substituted for canvas or duck in making awnings for back porches in northern cities. In this case the stripe patterns are used.



Osnaburg.

The check patterns, "produced by using the same pattern in warp and filling," are usually broad effects, belonging, in fact, to the plaid order of patterns. These checks measure from one to two inches either way.

WOVEN WITH A PLAIN LOOM.

Osnaburg is always woven with a plain weave $\frac{1}{1}$, and in the stripe patterns the stripe is made with warp, all white filling being used. This line can be woven on any plain sheeting

loom as it requires but one filling box. The check patterns are made on Mason box loom, Fairmount or Bridesburg loom, or any loom having a box motion attached.

In arranging check or plaid patterns the strong, long or broad way of the pattern indicates the filling and the greatest number of threads per inch indicate the warp, and to square a check or plaid pattern means to practically produce the same color effect in the filling as in the warp. Hence the filling pattern (total number of picks).

MUST BE REDUCED

so as to create a check or plaid pattern in which the filling arrangement is just noticeably longer in effect than in the warp pattern, the supposition being that as checks or plaids are worn they are always observed at an angle of several degrees, thereby in a sense overcoming any reasonable excess in the length of filling pattern, as compared with that of the warp.

Osnaburg is sometimes sized in the finishing, and at other times is not, this point being optional with the manufacturer in accordance with purpose for which the cloth is intended to be used. Generally it is taken from the loom, measured, run through the brusher, and after being lapped or rolled is pressed and put in the case and shipped.

Construction—30-inch Finish.

Reed, 900—33¾ inches in reed, including 16 ends selvedge, two ends per dent; 1-16s warp and filling; 46 picks per inch filling; 10 per cent take-up: 1,696 plus 16 equals 1,712 ends in warp. 1,696 divided by 80 equals 21 patterns plus 16 ends plus selvedge.

WARP PATTERN.

36 blue	Filling same.
20 white	
4 blue	
20 white	
80	

40 ends blue per pattern x 21 equals 840 plus 16 equals 856 ends blue; 40 ends white per pattern x 21 equals 840 plus 16 equals 856 ends white; 46 picks x33¾ equals 1.752 yards filling equals 876 yards blue, 876 yards white.

Carding and Spinning Particulars.

As the cloth under description in this issue is made and used in the South, it is to a great extent made only in southern mills and the machines required to produce this class of yarns belong to the first division of mills previously given, i. e., the mills making low and medium count yarns. The counts of the yarn required to make this class of goods vary from 1-14s to 1-20s warp and filling, but for this article we will assume the warp and filling yarns to be 1-20s. These yarns are made from a short staple low-grade cotton of about ⅞ inch staple.

THE MIXINGS

should be as large as possible and the mixing is generally done by hand in southern mills. It is run through 2 processes of picking and an opener and waste is sometimes used in the mixture, i. e., card strips and comber waste (when it is possible to obtain it). Too much waste should not be used because of the trouble that it gives on the machines of the card room, such as licking, etc.

THE HOPPER

should be kept as full as possible so that the amount of cotton fed to the opener will be as uniform as possible. It will be understood that if the hopper is allowed to get almost empty before filling it up the lifting apron of the hopper will not carry or lift as much cotton on its spikes and oftentimes there will be little or no cotton presented to the evener roller. This is sure to produce an uneven lap at the front of the breaker picker. If on the other hand the hopper is always kept full of cotton the lifting apron will always have a surplus of cotton on it, this surplus being struck off by the evener and dropped back into the hopper again. It will thus be seen that to keep the hopper more than half full all the time is

ONE OF THE MOST IMPORTANT POINTS

of the picker room, because, if you have an uneven lap to start with, you will have to make the succeeding machines overwork to obtain an even yarn. The speeds of the various parts of the picker should be about the same as given in the last article and the weight

856 ends blue + 10% take-up =	951 yards 1-16s =	1.135 ounces	Warp.
856 ends white + 10% take-up =	951 yards 1-16s =	1.135 ounces	
	876 yards 1-16s =	1.043 ounces	Filling.
	876 yards 1-16s =	1.043 ounces	
		4.356 ounces.	

Brush and press.

of the finished lap should be at least 39 pounds at the finisher picker. Always keep laps enough of the card room so that, if an accident happens to the picking machinery, the cards will not be stopped for laps. Keep at least 10 per cent ahead.

The wire fillet used on the cards should be coarse, that used on the cylinder being

ONE NUMBER COARSER

than that used on the doffer and flats. A great many mills in the South use No. 33 wire on the cylinder and No. 34 or No. 35 on the doffer and flats. On this class of goods use as large a diameter doffer as possible, either a 26 or 27-inch. Grind cards often and keep top flats sharp,because, if the flats are dull, good carding cannot be obtained. The draft of the card for this class of goods should not exceed 100. The speed of the licker-in should be at least 350 revolutions per minute. The

WEIGHT OF SLIVER

at front should be about 65 grains per yard. The sliver is put through two processes of drawing, the weight of sliver at the front of the finishing being about 70 grains per yard. The settings of the drawing frame rolls should be as follows: for ⅞-inch stock,front to second roll, 1⅕ inches; second to third, 1⅜ inches; third to back, 1⅞ to 2 inches. The slubber roving should be .50 hank.

Two processes of fly frames are used. the hank roving at the first intermediate being 1.50 and at the second 4.00 hank. Always look out for bunches at the fly frames and be sure that your steel rolls are set to the best advantage. Keep your

TOP LEATHER ROLLS

in perfect condition and do not run one that is cut, bruised, uneven or channeled. See that the traverse guides are all working so as not to make channeled rolls. The cotton roving is taken to the ring spinning room and here made into the required count of yarn. The following are good particulars to be used on 20s warp and filling on spinning frames: warp, gauge of spindle 2¾inches; diameter of ring 1½ inches, length of traverse 6½ inches; for filling, gauge of spindle, 2¾ inches, diameter of ring 1½ inches; length of traverse 6½ inches; speed of spindles, 7,250 revolutions per minute. Use any of the best spindles on the spinning frame. The yarn is taken to the spooler room and spooled and then run on a warp beam,thence to the slasher where it is sized and then is ready for weaving unless the yarn has to be dyed before being woven as in the present article. Then the method differs somewhat.

Dyeing Particulars.

Light blue is dyed with the ordinary indigo blue vat, but as sulphur blues are faster to exposure and washing, they are mostly dyed.

LIGHT BLUE.

1 per cent immedial indone 3B, ½ per cent immedial indone B, 2 per cent sulphide sodium, 2 per cent soda, 20 per cent Glauber's.

DARK BROWN.

4 per cent immedial cutch O, 6 per cent immedial brown A, ½ per cent immedial black NG, 10 per cent sodium sulphide, 3 per cent soda, 30 per cent Glauber's.

SLATE.

1½ per cent katigen black SW, 2 per cent sulphide sodium, 2 per cent soda, 30 per cent Glauber's.

RED.

5 per cent benzo fast red 4 BS, 3 per cent sal soda, 30 per cent Glauber's.

LIGHT ORANGE.

2 per cent immedial orange C, 2 per cent sodium sulphide. 3 per cent soda, 20 per cent Glauber's.

DRAB.

1 per cent immedial black NG, 1 per cent immedial brown A, 2 per cent sodium sulphide, 30 per cent Glauber's, 3 per cent soda.

SHEETING.

Sheeting is a light-weight, single cloth, composed of all cotton yarns, from 1-18s to 1-40s warp and filling, standard goods weighing 2½ to 6 yards per pound. It is sold in both the gray and bleached state, the bleaching being done after the cloth is woven.

Sheeting is never made in colors or patterns, but always in solid bleached or unbleached effects, and is woven on any and all single box roller looms, such as Draper, Lowell, Mason, Colvin, Kilburn & Lincoln, etc., cotton harness being used in most cases.

The Draper loom has the peculiar advantage over the other looms, in that it has an automatic warp stop motion, which stops the loom when a warp end breaks, also having a filling hopper or magazine which holds 18 filling bobbins, the filling replenishing itself in the shuttle as the bobbin be-

comes empty. All the looms have an automatic let-off motion to regulate the warp.

Sheeting warps are all made on

THE SLASHER,

there being either four or six beams to a set, and these are filled with yarn run from spools set in the creel rack of the warp mill. Each beam has a proportionate number of the total warp ends, viz., 2,000 ends, four beams, equals 500 ends per beam. These beams are set in regular order at the further end of the slasher frame. The total warp ends are then run through a solution of size, and around the hot cylinder, and then upon a beam, thereby sizing and beaming the warp at one operation.

Sheeting requires nothing in the way of finishing, except being run through a plate folder, on which machine, having a brush attached, the cloth is at once brushed and folded in any desired length of fold.

36 inches is the standard width for sheeting.

CONSTRUCTION.

Always a $\frac{1}{1}$ plain weave.

4 square inches equals 4.15 grains.

36 x 36 equals 1,296 x 4.15 equals 5,378.4 divided by 4 equals 1,344.6 divided by 437.5 equals 3.07 ounces per yard.

30 pieces yarn (warp) x 2½ inches equals 70 inches equals .89 grains minus 6 per cent size equals .83 grains. 70 x 7,000 equals 490,000 divided by .83 equals 590,361 divided by 36 equals 16,399 divided by 840 equals 19.5 or 1-20s warp.

60 pieces yarn (filling) x 1½ inches equals 90 inches equals .89 grains. 90 x 7,000 equals 630,000 divided by .89 equals 707,864 divided by 36 equals 19,662 divided by 840 equals 23.41 or 1-24s filling.

48 ends per inch plus 44 picks per inch equals 44 ends in reed and 42 picks in loom.

Reed 800—2 ends per dent, 38 inches, including 16 ends selvedge, 6 per cent ~~size on warp~~ 10 per cent take-up on warp, 5½ per cent contraction in width.

1,728 plus 16 equals 1,744 ends plus 10 per cent take-up equals 1,937 yards 1-20s warp equals 1.83 ounces; 42 picks x 38 equals 1,586 yards, 1-24s filling equals 1.25 ounces; total 3.08 ounces.

Standard grades equals 36 inches wide.

52 ends, 52 picks, 1-20s cotton warp and filling; 6 per cent size, 5½ per cent shrinkage in width in weaving; 38 inches in reed; 4.10 yards per pound.

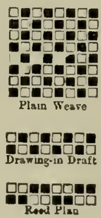
64 ends, 64 picks, 1-32s warp, 1-40s filling; 6 per cent size, 5½ per cent shrinkage in width in weaving; 38 inches in reed; 5.86 yards per pound.

Carding and Spinning Particulars.

The counts of the yarns used in making sheetings vary in different parts of the country in different mills and even in the same mill two grades of sheetings are sometimes made. The mills that make sheetings may belong to any one of the three divisions as given in a previous article. In this article we will consider the sheetings in two grades, the first being made up of 18s warp and the finer grade made up of 40s warp and filling. The first or

COARSE GRADES OF SHEETINGS

are made in the first division of mills and the staple of cotton used would be about one inch in diameter. The mixing would in most cases be performed by hand and should be as large as possible. It would be put through two processes of picking, first being



run through an opener. The speeds of the various parts on the machines in this room would be as follows: Speed of beater on openers, 1,050 revolutions per minute; fan, 350; speed of beater on breaker picker, 1,500 revolutions per minute; speed of fan, 1,400 revolutions per minute; speed of beater on finisher picker, 1,450 revolutions per minute; speed of fan, 1,100 revolutions per minute. The

WEIGHT OF THE LAP

at the different machines for this class of goods would be as follows: At the front of the breaker picker, 40 pounds or 16 ounces to the yard; at the front of the finisher picker, 39 pounds or 14½ ounces to the yard. Always keep the hopper of the opener full. The above speeds and number of processes could also be used for fine sheetings, using 40s yarn with the following exceptions: Instead of being mixed by hand, a bale breaker and conveying trunks would be used, and the staple of cotton would be about 1⅜ inches. The weight of the lap at the breaker would be about the same, but at the finisher picker would be less or about 35 pounds for the total

weight of lap or 12½ ounces to the yard. Always have laps of both classes uniform in weight, and, if the laps vary one-half pound in either direction from standard weight, they should be set aside and put back into mixing. Use cut roving in the mixing, mixing it as shown in a previous article. Double four into one in the picker room. The

SETTINGS FOR THE CARD

for the coarse sheetings should be wide, because of the large weight of cotton lap being passed through, and coarse wire should be used, 33 on the cylinder and 34 on tops and doffer. The drafts should not exceed 100 and the production should be about 900 pounds per week of 60 hours, the weight of the sliver being 65 grains to the yard. The settings for the finer sheetings at the card should be closer and a fine wire fillet should be used. The draft of the card should not be less than 100 and the production should not exceed 600 pounds per week of 60 hours. Grind cards and tops as often as possible and strip three times a day on both grades of sheetings. Go over the settings after each grinding and keep cards clean.

The coarser grade of sheeting is put through

TWO PROCESSES OF DRAWING,

the weight per yard of the sliver at the front being 70 grains per yard, the doublings being six into one and the speed of the front roll 400 revolutions per minute. The finer grade of sheeting is put through three processes of drawing, the other particulars being the same, excepting the settings, which are wider. Good settings are as follows: For one inch stock, front to second roll, 1⅛ inches; second to third roll, 1¼ inches; third to back roll, 1½ inches; for 1⅜ inch stock, from front to second, 1½ inches; second to third, 1⅝ inches; third to back, 1¾ inches. Keep bottom steel rolls clean and top leather rolls should always be in perfect condition. Varnish those rolls at regular intervals and always keep a supply of extra varnished rolls on hand, so that imperfect rolls may be taken out at any time and replaced by rolls in good condition. The hank of the roving at the front of the slubber should be .55 to .50 in each case. The coarser sheeting yarn has to be put through two processes of fly frames, the hank at the first intermediate being 1.50 and at the second 5 hank.

THE ROVING

for making the finer sheeting passes through three processes of fly frames, the hank roving at the different processes being as follows: First intermediate, 1.50; second intermediate, 4, and fly frame, 10. The roving for both grades of sheetings are spun into yarn on the ring spinning frame. The particulars for a warp frame for spinning 18s being No. 4 Draper, McMullen or Whitin spindle; gauge of frame, 2¾ inches; diameter of ring 27 inches; traverse. 7 inches; speed of spindle, 9,400 revolutions per minute, turning off about 2½ pounds per spindle per week of 60 hours. For a warp frame making 40s yarn, use No. 2 Draper, McMullen or Whitin spindle, gauge of frame 2¾ inches; diameter of ring, 1⅝ inches; traverse, 6½ inches; speed of spindle, 10,000 revolutions per minute, producing about .95 pounds per spindle per week of 60 hours. The warp yarn is spooled and warped and run through the slasher. A good

SIZE MIXTURE

for 18s yarn, one set of beams, 1,500 to 2,000 pounds, is as follows: 160 gallons of water, 100 pounds starch, 20 to 40 pounds sizene (according to make), 2 to 8 pounds tallow, according to results. For 68 x 68 heavy sheetings, with 22s warp yarn, use 100 gallons water, 70 pounds potato starch, 4 pounds tallow and 1 pint of turpentine.

CHEVIOT SHIRTING.

Cheviot shirting is a narrow, all-cotton fabric, weighing from four to five ounces per yard of 27 inches width finished and is composed of single or double ends in the warp and single filling. The effect of the double ends is entirely different from that produced by a two-ply thread, and is really meant to create a rib weave effect.

This fabric is made of cotton yarns, from 1-16s to 1-22s in the warp and filling, and the cloth contains from 40 to 46 double ends per inch in warp and 36 to 40 picks per inch in the filling. Another grade is made by weaving 36 to 62 single ends per inch in the cloth, and 19 to 52 picks per inch in the filling finished.

BY THE FIRST METHOD

there is produced a cloth that is at once stout and pliable, and having excellent wearing qualities. This cloth is used principally in the manufacture of shirts and mock shirts for the use of workmen accustomed to rough, dirty work, such as miners and railroad men, and those similarly em-

ployed. It is made in stripe pattern, usually of the darker tones of fast colors, such as dark blue, dark brown, etc., in the warp, and filling to match. In these warp stripe patterns the dark colors form the body or ground of the pattern and the white warp forms but a narrow pin stripe in the cloth. Then there are the light patterns, in which nearly all the bright colors are used, such as light blue, orange, red, light green, etc. In this case the body or ground of the cloth is formed by the white warp, and the bright color forms the pin stripe in the cloth. Print yarns are occasionally introduced in the light colored patterns to create mixed color effects. The filling in the light patterns is always white. In making cheviot shirting there is rather

A HEAVY SIZE

placed upon the warp yarn. This permits of the cloth retaining quite a percentage of size after weaving, and as this fabric receives nothing but sprinkling and pressing after leaving the loom, the excessive amount of size gives the fabric a better cover, feel, and apparent bulk, which is its most distinguishng feature as a material for workmen's shirts.

Cheviot shirting can be woven upon any plain roller loom, either single or double box, such as the Mason, Lewiston, Lowell, Colvin, Kilburn and Lincoln, Mutual or Fairmount looms. It is generally drawn in and woven on 4 harnesses so as not to crowd the heddles in weaving, as would be the case if but 2 harnesses were used. Most all cheviot shirting is woven with a plain weave, although sometimes a $\frac{2}{1}$ warp effect, 45 degree twill weave, is used.

CHEVIOT SHIRTING.

1 square inch equals 1.83 grains. 27x36 equals 972x1.83 equals 1,778.76 divided by 1 square inch equals 1,778,-.76 divided by 437.5 equals 4.065 ounces per yard.

44 pieces white warp yarn x ½ inch long equals 22 inches equals .35 grains. .35 grains minus 10 per cent size on warp equals .315 grains. 22x7,000 equals 154,000 divided by .315 equals 48,888 divided by 36 equals 1,357 divided by 840 equals 1-16s cotton.

110 pieces blue warp yarn x ½ inch long equals 55 inches equals .9 grains. .9 grains minus 10 per cent size on warp equals .81 grains. 55x7,000 equals 385,000 divided by .81 equals 475,308 divided by 36 equals 13,203 divided by 840 equals 15.71 or 1-16s cotton.

15 pieces blue filling yarn x 2 inches long equals 30 inches equals .45 grains. 30x7,000 equals 210,000 divided by .45 equals 466,666 divided by 36 equals 12,-962.8 divided by 840 equals 15.43 or 1-16s cotton.

CONSTRUCTION.

Reed, 700, 4 ends per dent; 28½ inches in reed including selvedge.

532 plus 10 equals 542 splits or 2,168 ends; 1-16s cotton warp yarn.

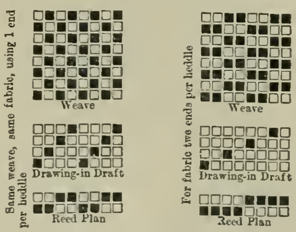
38 picks per inch; 1-16s blue cotton filling yarn.

10 per cent size on warp; 5¼ per cent contraction in width in weaving.

8 per cent take-up in length of warp in weaving.

Finish equals sprinkle and press equals 27 inches finished width.

Plain weave, warp drawn in on 4 harnesses.



WARP PATTERN.
8 blue.
2 white.
2 blue.
2 white.
—
14 ends per pattern.

2,128 ends in warp divided by 14 equals 152 repeats in pattern. 10 blue ends per pattern x 152 equals 1,520 plus 40 ends blue selvedge equals 1,560 ends, 1-16s blue warp yarn. 4 white ends per pattern x 152 equals 608 ends, 1-16s white warp yarn.

1,560 ends, 1-16s blue warp yarn plus 8 per cent take-up equals 1,695 yards equals 2.017 ounces. 608 ends, 1-16s white warp yarn plus 8 per cent take-up equals 660 yards equals .785 ounces. 38 picks, 1-16s blue filling yarn x 28½ inches equals 1,083 yards equals 1.265 ounces; total 4.067 ounces.

4.067 ounces per yard, 27 inches wide finished.

Carding and Spinning Particulars.

The mills which make the counts of yarn required for cheviots belong to the second division, given in a previous article. This is one of the coarser

yarns made in this division and is manufactured from stock of about 1 inch in staple. The mixings should be as large as possible and are generally done by hand, although this division of mills is generally equipped with a bale breaker. Of course, if the bale breaker is not too hard pushed or is stopped on account of all the other bins of better grades of cotton being full, then the raw stock for this class of goods will be run through the bale breaker. The bale breaker is capable of handling 80,000 to 90,000 pounds per week and requires about 2 iron horse power to drive it.

IF FLOOR SPACE IS AVAILABLE

two mixing bins should be used instead of one for reasons before stated. The cotton, after being dried out, should be run through two processes of picking and an opener. Keep the hopper of the opener as near full as possible to make an even lap at the front. Keep the pin roller of the opener clear of all cotton, so that it may be able to do its duty. On some makes this roller is a great deal of trouble, which is caused by the cotton adhering to it and winding around it until it does not strike the cotton from the lifting apron properly. This is especially true when sliver waste (from all machines which make sliver) is mixed in with the raw stock at the bins (as is customary). The speed of the opener beater for this class of cotton should be 1,100 revolutions per minute. The speed of the breaker beater should not exceed 1,500 revolutions per minute.

THE WEIGHT OF THE LAP

at the front should be about 40 pounds or 16 ounces to the yard of lap. Care should be taken that the drafts on both the breaker and finisher pickers are regulated to the best advantage so as to obtain a smooth, firm, even lap at the front. To do this the draft is directed so that the cotton, after being acted upon by the beater, is blown on the top cage. The laps made at the breaker are put up at the back of the finisher picker and doubled 4 into 1. The speed of the finisher picker beater should be 1,450 revolutions per minute, which gives this grade and staple of cotton passing by it about 42 beats to the inch. The weight of the total lap at the front should be about 39 pounds, which gives what is known as a 14½-ounce (to the yard) lap.

OILING.

Take care to oil all rapidly moving parts of the pickers at regular and frequent intervals and keep all fly from collecting under these machines. See that the pickers are properly cleaning the cotton, and don't make the card do the picker's work. The laps from the finisher picker are put up at the back of the card, the draft of which (for this class of goods) should not exceed 100. The wire fillet used should also be not too coarse. Always keep an eye on the settings and watch the flat waste, because from the appearance of this waste we are able to tell whether the cotton is being properly carded or not.

THE SLIVER

should weigh about 65 grams per yard and the production should be around 900 pounds per week of 60 hours. Keep card wire sharp. The sliver is next run through 3 processes of drawing, the doubling being 6 into 1. The weight of the finisher drawing should be about 70 grains. The slubber roving should be about .50 hank and there should be two processes of fly frames. The roving at the first intermediate should be 1.50 and at the second either 4 or 4.50, according to whether warp or filling yarn is to be made from it, the fine hank being made into 22s filling yarn and the coarser hank roving being made into 16s warp yarn. The yarn for this class of goods is spun on

A RING SPINNING FRAME.

the particulars of which are as follows: For warp frame spinning 16s use McMullen, Whitin or Draper No. 4 spindle; gauge of frame 2¾ inches; diameter of ring, 2 inches; length of traverse, 7 inches; speed of spindle, 9,400 revolutions per minute; for filling frame making 22s, spindle as above except No. 2 Draper; gauge of spindle, 2¾ inches; diameter of ring, 1½ inches; length of traverse, 6½ inches; speed of spindle, 7,400 revolutions per minute.

Dyeing Particulars.

Following are good formulas for the colors used in dyeing cheviot shirtings:

LIGHT GREEN.

2 per cent immedial yellow D; 4 per cent immedial indone 3B; 5 per cent cent sodium sulphide; 3 per cent Glauber's; 3 per cent soda.

ORANGE.

4 per cent immedial orange C; 4 per

cent sodium sulphide; 3 per cent soda; 30 per cent Glauber's.

DARK BLUE.

3 per cent immedial indone 3 B; 3 per cent immedial indone R; 2 per cent immedial indone B; 11 per cent sodium sulphide; 3 per cent soda; 30 per cent Glauber's.

DARK BROWN.

2 per cent thion black B; 8 per cent thion brown G; 10 per cent sodium sulphide; 3 per cent soda; 30 per cent Glauber's.

SLATE.

2 per cent thion black B; 2 per cent sodium sulphide; 2 per cent soda; 20 per cent Glauber's.

RED.

5 per cent benzo scarlet 4 BS; 3 per cent sal soda; 30 per cent Glauber's.

YELLOW.

1 per cent chloramine yellow M; 3 per cent sal soda; 20 per cent Glauber's.

SALMON.

½ per cent benzo fast orange S; 2 per cent sal soda; 20 per cent Glauber's.

OLIVE.

5 per cent pyrogene olive N; 5 per cent sodium sulphide; 3 per cent soda; 30 per cent Glauber's.

BLACK.

15 per cent katigen black S W; 15 per cent sodium sulphide; 3 per cent soda; 30 per cent Glauber's.

After dyeing, all of the colors mentioned must be well rinsed with three waters. A light soaping at the boil must then be given, followed by another rinsing. The colors will be fast to washing and will not bleed into each other.

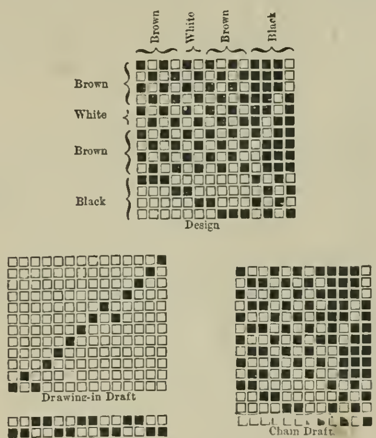
NOVELTY DRESS GOODS.

Novelty dress goods is a light-weight single cloth fabric, made from single and two-ply cotton yarns in both warp and filling, and is woven in large and small plaids, also solid colors. The distinct feature of this fabric is the prominence given the heavy yarns, which are always woven with a fancy weave in such a manner as to form an all-over effect in imitation of a jacquard pattern. The ground or body of the cloth is usually woven with a plain weave, $\frac{1}{1}$.

In the better grades of novelty dress goods, merino and silkoline yarns are often used. In making this class of goods it is sometimes necessary to use two beams in weaving, as the difference of take-up in the ground and fancy yarns will not permit of one beam being used.

Novelty dress goods are made to weigh from 3 to 5 ounces per yard; generally 1-20s to 1-30s cotton ground warp and filling yarns, and 2-20s to 2-40s, and 1-8s to 1-12s yarns are used to produce overplaided or novelty weave effects.

This fabric is made in all dress goods colors and goods patterns produced by using dark green, brown,



Design

Drawing-in Draft

Reed Plan

Chain Draft

dark or cherry red, navy blue, etc., for ground color and crossing these with black.

Cotton novelty goods can be woven in any power loom having a box motion and dobby or head motion attached. Mutual or Fairmount 4x1 box looms, having either Ingraham, Oldham or Stafford top, are all right for this line.

To finish these goods, they are measured, then brushed and run through a steam box to liven the colors, after which they are rolled and pressed, ready to pack and ship.

CONSTRUCTION.

27 inches finished.

4 square inches equals 5.7 grains. 27 x36 equals 972x5.7 equals 5,504.4 divided by 4 equals 1,385 divided by 437.5 equals 3.165 ounces per yard.

20 pieces black warp yarn x 2 inches equals 40 inches equals 1 grain. 40x

7,000 equals 280,000 divided by 1 equals 280,000 divided by 36 equals 7,777 divided by 840 equals 2-20 black warp.

38 pieces brown warp yarn x 2 inches equals 76 inches equals .92 grains. 76 x7,000 equals 532,000 divided by .92 equals 578,260 divided by 36 equals 16,062 divided by 840 equals 1-20 brown warp.

12 pieces white warp yarn x 2 inches equals 24 inches equals .27 grains. 27x 7,000 equals 168,000 divided by .27 equals 622,222 divided by 36 equals 17,284 divided by 840 equals 1-20 white warp.

24 pieces black filling yarn x 3 inches equals 72 inches equals 1.45 grains. 72x7,000 equals 504,000 divided by 1.45 equals 347,586.2 divided by 36 equals 9,655.17 divided by 840 equals 1-12 black filling.

17 pieces brown filling yarn x 3 inches equals 51 inches equals .5 grains.

51x7,000 equals 357,000 divided by .5 equals 7,140,000 divided by 36 equals 198,333 divided by 840 equals 1-24 brown.

12 pieces white filling yarn x 3 inches equals 36 inches equals .35 grains. 36x7,000 equals 252,000 divided by .35 equals 7,200,000 divided by 36 equals 200,000 divided by 840 equals 1-24 white filling.

50 ends per inch finished and 48 picks per inch finished equals 44 ends per inch in reed and 43 picks per inch in loom.

10 per cent take-up on white and brown warp, 2 per cent on black warp.

WARP PATTERN.

4 Brown
2 White
4 Brown
4 Black
} Filling same.

32 ends white selvedge.

Reed 800—2 ends per dent.

30½ inches in reed including selvedge.

95 repeats of pattern plus 4 ends.

1,334 ends plus 32 ends selvedge. 8 brown per pat. x 95 patterns equals 760 plus 4 equals 764 plus 10 per cent take-up equals 848.88 yards 1-20 equals .8084 ounces. 4 black per pat. x 95 patterns equals 380 plus 10 per cent take-up equals 400.00 yards 2-20 equals .7619 ounces. 2 white per pat. x 95 patterns equals 190 plus 10 per cent take-up equals 211.11 yards 1-20 equals .2010 ounces. 32 white selvedge plus 15 per cent take-up equals 37.64 yards 1-20 equals .0358 ounces. Total warp weight, 1.8071 ounces.

8-14 of filling equals brown or 740.56 yards 1-24 equals .5877 ounces. 4-14 of filling equals black or 370.28 yards 1-12 equals .5877 ounces. 2-14 of filling equals white or 185.14 yards 1-24 equals .1469 ounces. Total 3.1294.

3.1294 ounces finished, 27 inches wide.

Carding and Spinning Particulars.

The yarns for novelty dress goods would probably be made in mills of the second division. For this class of goods three or more different counts of yarns are generally used, the counts varying from 4s to 40s, the medium yarn being from 20s to 30s. For the cloth under description we will consider that the yarns used are as follows: 8s, to produce one effect and 2-20s another, both of these yarns being used on the face of the cloth, and 1-30s for the ground warp and filling yarns. In some mills it is the custom to make all these counts of yarns from one staple and grade of cotton to save time and to reduce the number of mixings in order that the cotton may pass up to a certain point on the same machines, the only difference being that the finer yarns are run through one more process of fly frames. While this undoubtedly saves time and machines and may be done when the counts of yarn used in the cloth do not vary a great deal, still it is generally the case to have two or even three different mixtures, one for the very coarse, one for the medium and one for the fine yarns. In this lesson we will consider that there are

TWO MIXINGS,

or in other words, two grades and staples of raw stock used, one for the 8s and another mixing for the 20s to 30s yarn. For 8s yarn the staple of the raw stock should be from ⅞ to 1 inch in length and for the finer counts, cotton of from 1⅛ to 1 3-16 inch staple may be used. The ⅞-inch stock would probably be mixed by hand, i. e., taken from the bale and pulled into small bunches and spread in the mixing bin by the help. In this mixture all good waste of the same length of staple is used, the roving waste being treated, as previously mentioned; sometimes, but not often, comber waste is used, but a large percentage should not be used.

FOR THE FINER COUNTS

the raw stock would be run through a bale breaker or, if no bale breaker was in the mill equipment, then the cotton would be mixed by hand the same as cotton for the coarser counts except that no comber waste would be used. Two processes of picking and an opener would be used with both processes. All the points in connection

with the opener given in former articles should be carefully observed; the speed of the fan of the breaker should be about 1,500 revolutions per minute for both stocks and the weight of the laps 40 pounds or 16 ounces to the yard. The speed of the fan at the finisher picker should be a little less than at the breaker picker and the speed of the fan about 1,100 revolutions per minute. This gives the cotton passing under the action of the beater about 42 beats or blows per inch. The weight of the lap of the ⅞-inch stock should be 39 pounds or 14 ounces to the yard, and for the finer counts of yarn, 35 pounds or 12½ ounces to the yard. The

DRAFT OF THE CARD

for the coarser count should not exceed 100 and for the finer count should not be less than 100. The same size of wire fillet may be used for both grades or, generally speaking, No. 33 wire fillet for cylinder and No. 34 wire fillet for doffer and top flats. The main points of difference would be in the setting of the card for the different stocks, the longer staple of cotton requiring the closer settings, the production for the ⅞-inch stock being 900 pounds and for the 1⅛-inch stock from 750 to 800 pounds per week of 60 hours. The doffer of the card should be as large as possible in both cases, either 26 or 27 inch diameter. Keep

THE CARD WIRE

sharp and be sure that the wire on the flats is of uniform length, because, if this is not the case, bad work is bound to result on account of the fact that even settings of the flats with the cylinder cannot be obtained. The weight per yard of the sliver would be the same in both cottons or 65 grains per yard. The ⅞-inch stock would be put through two processes of drawing and the longer staple three processes, doubled 6 into 1 in both cases. The weight of the sliver at the finisher drawing would be the same, or 72 grains per yard. The same hank roving would be made at the slubber, or .55 hank, although the

SETTINGS OF THE ROLLS

of both of the last named processes would be different. Only one process of drawing would be used on the ⅞-inch stock and at the fly frame it would be made into 1 hank roving and from here passed to the spinning room. For the 1⅛-inch stock two processes would be used. At the first intermediate the slubber roving would be made into 2 hank roving and at the second the roving for 20s count yarn would be made into 4 hank and for the 30s count would be made into 6 hank. The roving would then be taken to

THE SPINNING ROOM,

where the required count would be spun. The particulars for a warp frame making 20s yarn have been given in a previous lesson; for a warp frame making 8s, the following particulars may be used; any high-grade spindle, length of traverse, 7 inch, gauge of spindle, 3¼ inches, diameter of ring, 2⅛ inches, speed of spindle, 8,100 revolutions per minute. For a warp frame making 30s use gauge of spindle, 2¾ inches, diameter of ring, 1⅝ inches, length of traverse, 6 inches, speed of spindle, 9,800 revolutions per minute. The yarn is then spooled and warped and dyed. For some of the effects produced in this class of goods two yarns of different colors are twisted together; for this a machine known as a twister is used, one thread of each color being twisted together.

Dyeing Particulars.

DARK GREEN.

4 per cent tetrazo brilliant green J; 30 per cent Glauber's; 3 per cent sal soda.

RED.

4 per cent tetrazo fast red 4 B; 30 per cent Glauber's; 3 per cent sal soda.

LIGHT SKY BLUE.

1 per cent tetrazo blue, 6 B new; 20 per cent Glauber's; 2 per cent sal soda.

WINE.

3 per cent tetrazo corinth; 30 per cent Glauber's; 3 per cent sal soda.

DARK BLUE.

3 per cent tetrazo blue B X; 30 per cent Glauber's; 2 per cent sal soda.

DARK BROWN.

3 per cent tetrazo dark brown; ½ per cent tetrazo black brown; 30 per cent Glauber's; 2 per cent sal soda.

LILAC.

2 per cent tetrazo chlorine lilac B; 2 per cent sal soda; 20 per cent Glauber's.

LIGHT SLATE.

¼ per cent tetrazo black N; ¼ per cent tetrazo brilliant blue B B; 2 per cent sal soda; 25 per cent Glauber's.

DARK SLATE.

1½ per cent tetrazo black N; ½ per cent tetrazo blue 3 B; 2 per cent sal soda; 30 per cent Glauber's.

OLIVE.

¼ per cent diamine fast yellow B;

3 per cent diamine bronze G; 2 per cent sal soda; 30 per cent Glauber's.

BLACK.

5 per cent tetrazo black N; 3 per cent sal soda; 30 per cent Glauber's.

NAVY BLUE.

3 per cent tetrazo blue B X; ½ per cent tetrazo blue 4 R; 3 per cent sal soda; 30 per cent Glauber's.

The above colors are for first baths, for a standing bath. One-third of the color can be taken away from these amounts. After dyeing, yarn must be well rinsed in water.

DRILL.

Cotton drill is a medium weight, single cloth, weighing from 4 to 6 ounces and composed of coarse all-cotton yarns, warp and filling. It is always made with a small uneven sided twill weave, generally $\frac{2}{1}$ (warp effect) twill weave.

Drill is sometimes made from yarns in the gray and afterwards dyed in the piece, or in solid warp color effects, such as indigo blue and dark brown, white filling being used in each instance.

It can be woven in any single box roller loom, such as Draper, Lowell, Lewiston, Colvin, Mason, or Kilburn & Lincoln, and is usually drawn in and woven on cotton harness, as these are light in weight and wear better than wire heddles for this style of cotton goods.

THE WARP

is beamed on the slasher, the warp proper being divided into a certain number of sections, in accordance with the number of ends to be used in the drill warp. These sections are beamed on the warp mill, the yarn being run on to the beam from the spools in the creel rack. The several section beams, when completed in the warp mill, are assembled in the beam rack at the end of the slasher and the yarn from each beam is run through the size tub and over the drying cylinder of the slasher at the same time, on to the slasher beam, thus making a complete warp, the sizing and beaming being done at one operation.

Slasher warps do not have a lease in them, the yarn being kept nearly straight in place by the use of a slasher comb, which is, in fact, a shallow reed having one open side. The comb is pressed through the threads, while they are spread taut in the slasher frame and a wooden cap is then fastened upon the open side of the slasher comb, thereby holding the yarn in place for the operation of drawing in.

The drawing in is performed by girls, without the aid of a hander in, as is the case when pattern warps are drawn in from a lease.

The drawer in for drill, uses a three-bladed hook (a blade for each harness) and the harnesses or heddles are hung upon a rack immediately in front of the beamed warp. The drawer in, if experienced, will pick out three heddles and three ends at one time, and continue to do so until the total warp ends are threaded through the harnesses or heddles.

To finish colored drill, the goods are taken from the loom and run through the brusher, to remove all lint and waste threads, after which they are put through the size tubs and then dry pressed.

CONSTRUCTION.

4 square inches equals 9.95 grains. 30x36 equals 1,080x9.95 equals 10,746 divided by 4 equals 2,686.5 divided by 437.5 equals 6.14 ounces per yard finished.

30 pieces blue warp x 2½ equals 75 inches equals 1.9 grains. 75x7,000 equals 525,000 divided by 1.9 equals 276,315.8 divided by 36 equals 7,675.43 divided by 840 equals 1-10s cotton.

30 pieces white filling x 1½ equals 45 inches equals .55 grains. 45x7,000 equals 315,000 divided by .55 equals 572,727 divided by 36 equals 15,909 divided by 840 equals 1-18s cotton.

66 ends per inch finished and 48 picks per inch finished equal 63 ends per inch loom and 44 picks per inch loom. 10 per cent take up in weaving minus 6½ per cent contraction in reed. 16 ends selvedge. 30 inches finished equals 32 inches in $\frac{2}{1}$ twill weave. 750 reed minus 3 ends per dent. Finish equals size and dry press.

66x30 equals 1,980 plus 16 equals 1,996 plus 10 per cent equals 2,218 yards 1-10s cotton warp equals 4.224 ounces. 48 picks x 30 equals 1,440 yards, 1-18s cotton filling equals 1.523 ounces.

4.224 ounces warp.
1.523 ounces filling.

5.747 ounces loom weight.

Carding and Spinning Particulars.

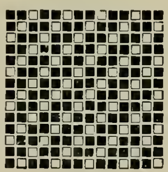
The machinery used to make the counts of yarns for the kind of

33, 66 x 45, 102.180.

cloth under description would be found in mills of the first and perhaps of the second division, as given in a previous lesson. As the yarns are made from a short staple, low-grade cotton, the mixing will probably be done by hand; i. e., the bales of cotton would be opened at the mixing bin and the cotton separated into small parts and piled up in the bin until it was full. The good waste from cards and drawing frames would also be mixed in with the raw stock, and in the cheaper grades of drill comber waste is sometimes used in small quantities. The same length of staple may be used for both warp and filling yarns and they may be run through the same machines up to the fly frames, and here

THE ONLY DIFFERENCE

is that the roving to make the filling yarn is run through one more process of fly frames than the warp yarn. The mixing is taken from the bins and thrown into the hopper of the opener and this hopper is always kept full. Keep the pin beater free from cotton, so that an even sheet of cotton may be



Weave

Drawing-in Draft

Reed Plan

6.140 ounces finished.
5.747 ounces loom.

.393 ounces = sizing in finishing.

About 6½ per cent of size.

passed up to the beater, the speed of which should be about 1,050 revolutions per minute. In modern mills this opener is built in connection with the breaker picker, and the cotton, after passing the beater, is thrown on to a moving lattice and is brought to the feed rolls of the breaker picker, which in turn condenses it and passes the beater which should have a speed of 1,500 revolutions per minute. See that the draught of this picker and also the finisher picker is so directed that the cotton, after passing the beater, will be blown upon the top of the pair of cages, as this will

HELP TO MAKE AN EVEN LAP

at the front end. The weight of the lap at the front end of the breaker should be about 40 pounds or about 16 ounces to the yard. The laps are then put up at the finisher picker and doubled four into one. The speed of this beater should be 1,450 revolutions per minute and the weight of the finished lap about 39 pounds or 14 ounces to the yard. The cotton receives about 42 beats to the inch at this machine. The draft of this machine is very small and very rarely exceeds 3. All heavy and quickly moving parts should be oiled frequently and keep the room clean. The laps are then put up at the card. The draft of this machine should not exceed 100 for this class of goods.

THE SETTINGS

should be wide, because it is the object to get off as many pounds as possible for this class of goods. Keep the wire sharp by frequent grindings. The speed of the licker-in should be about 300 revolutions per minute. The speed of the top flats should be one complete revolution in 40 minutes and the speed of the doffer from 13½ to 14 revolutions per minute. The diameter of the doffer should be as large as possible, say 26 or 27 inches. The production should be about 800 pounds for a week of 60 hours.

THE SLIVER

should weigh about 65 grains to the yard. The sliver is run through three processes of drawings, the weight at the finisher drawing being 70 grains. The doublings at the different processes of drawing should be 6 into 1 and the drafts should not exceed 6. The speed of the front roller should be 400 revolutions per minute. The slubber is the next process, and here the sliver should be made into a .50 hank roving. The warp yarn is then put through one more process of fly frame and made into 1.25 to 1.50 hank roving and from here passed to the spinning room. The filling yarn is put through one more process and is made into 2.50 hank roving and then passed on to the spinning room.

THE SPINNING FRAME

then draws the roving into the required hank by having the correct draft gear put on. Good specifications for both the warp and filling frames are as follows: for warp frame, for spinning 10s yarn, gauge of spindle, three inches: diameter of ring, two

inches; length of traverse, 7 inches; speed of spindle 8,600 revolutions per minute; twist per inch, 15.02; for filling frame spinning 18s yarn, gauge of spindle, 2¾ inches; diameter of ring, 1½ inches; speed of spindle, 7,200 revolutions per minute; length of traverse, 6½ inches; twist per inch, 13.79. The warp yarn is then spooled, warped and run through a slasher.

Dyeing Particulars.

Drills are yarn dyed, blue and brown, indigo or sulphur blues, cutch or sulphur browns.

PYROGENE INDIGO BLUE.

10 per cent color; 20 per cent sulphide sodium; 8 per cent soda ash; 35 per cent salt; 2 per cent mineral oil, 1 hour at 200 degrees F. Aftertreated with

1½ per cent bichrome; 1½ per cent sulphate copper; 3 per cent acetic acid, 9 degrees Tw. Well rinsed and soaped. A soap made of

2 per cent paraffin wax; 2 per cent glue; 2 per cent dextrine is considered very suitable. Turn for 15 minutes at 120 degrees F. Squeeze and dry.

BROWN.

5 per cent immedial cutch O; 1 per cent immedial dark brown A; 3 per cent immedial brown B; 8 per cent sulphide sodium; 3 per cent soda ash; 30 per cent Glauber's salt. Turn at 200 degrees F. for one hour, rinse and aftertreat:

1½ per cent bichrome; 1½ per cent sulphate copper; 3 per cent acetic acid, 9 degrees Tw.; 30 minutes at 200 degrees F. Rinse, and soap with a weak solution at boil.

A variety of shades are piece dyed on drills and used for various purposes, where a very strong cloth is required.

SLATE.

3 per cent thion black B; 3 per cent sulphide sodium; 3 per cent soda ash; 20 per cent common salt. Rinse well and soap.

BLACK.

15 per cent thion black G; 15 per cent sulphide sodium; 3 per cent soda ash; 30 per cent common salt. Rinse well and soap.

BUFF.

1 per cent thion brown G; ¼ per cent thion yellow R; 2 per cent sulphide sodium; 2 per cent soda ash; 30 per cent common salt. Rinse well and soap.

OLIVE.

4 per cent immedial olive B; ½ per cent immedial black N G; ½ per cent immedial yellow D; 5 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's salt. Rinse well and soap.

SKY BLUE.

3 per cent immedial sky blue powder; 3 per cent sodium sulphate; 3 per cent soda ash; 30 per cent Glauber's salt. Rinse well and soap.

GREEN.

10 per cent katigen green 2 B; 10 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's salt; rinse well and soap.

DARK BOTTLE GREEN.

10 per cent immedial dark green B; 2 per cent immedial yellow D; ½ per cent immedial black N G; 13 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's salt. Rinse well and soap.

RED.

5 per cent diamine fast red; 3 per cent sal soda; 30 per cent Glauber's salt. Rinse and aftertreat with 1 per cent fluoride chrome.

FLANNELETTE.

Flannelette is a narrow, light-weight fabric composed of all cotton yarns, from 1-30s to 1-14s in the warp and filling, the filling being soft spun to permit of the raising of a very slight nap on the back of the goods.

The cloth is woven with bleached yarn (warp and filling), the color effects being afterwards printed upon the face of the goods by the printing machine.

Flannelette is made with simple one or two colored stripe patterns, either black and white, or indigo blue and white, and in elaborate all-over floral designs in imitation of jacquard patterns, the ground colors being of a dark tone, and the figure of either harmonious or contrasting combinations of color. The finished fabric is sold by the retailer at 8 to 10 cents per yard, 27 inches wide, and is used very extensively in the manufacture

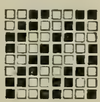
of ladies' wrappers, kimonos, etc., for house wear, and which, when soiled, can be thrown into the family wash and cleaned.

THE PRINTING OPERATION

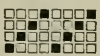
is performed by an automatic machine, which consists of a series of rollers or drums, over which the cloth is passed to hold it taut, and smooth all wrinkles so that the goods present an even surface to the printing roll.

Upon this roller the design or pattern is engraved, and the liquid color being fed upon it as it revolves, the cloth passes over the surface, and retains an exact impression of the design (in colors) that has been engraved upon the roller.

Flannelette can be woven in any single box roller loom, such as Draper, Lowell, Lewiston, etc., and the finish means taking from the loom and



Design



Drawing-in Draft

Reed Plan

Harness Chain

brushing off, to remove loose threads, then running through the napper to produce a nap on the back of the goods, after which the fabric is printed.

CONSTRUCTION.

27 inches finished.

4 square inches equals 4.85 grains. 27x36 equals 972x4.85 equals 5,714.20 divided by 4 equals 1,428.55 divided by 437.5 equals 3.034 ounces per yard, 27 inches wide.

20 pieces white warp x 2½ equals 50 inches equals .35 grains. 50x7,000 equals 350,000 divided by .35 equals 1,000,000 divide by 840 equals 1-30s cotton warp.

16 pieces white filling x 2 equals 32 inches equals .3 grains. 32x7,000 equals 224,000 divided by .3 equals 746,666 divided by 840 equals 1-24s cotton filling.

Reed 1,460 —29 1-3 inches—2 ends per dent; 16 ends selvedge, 10 per cent take-up; 2,376 ends, 1-30s white cotton warp (ex. of selvedge); 59 picks, 1-24s white cotton filling (soft spun); $\frac{2}{2}$ 45s twill weave (warp effect on face); finish equals very light nap on the back of the fabric or filling effect.

88 ends per inch finished and 64 picks per inch finished equals 81 ends in reed and 59 picks in loom.

88x27 equals 2,376 plus 16 equals 2.392 ends plus 10 per cent take-up equals 2,658 yards 1-30s warp yarn equals 1.687 ounces. 64 picks x 27 equals 1,728 yards 1-24s filling equals 1,371 ounces. Total 3,058 ounces.

———

Carding and Spinning Particulars.

The processes of machinery for making the required count of yarns for flannelette may be found in either the better class of the first division or in the second division of mills, as given in a previous lesson. A medium to low grade of cotton of from ¾ to 1⅛ inch staple may be used, according to the grade or mill in which the flannelette is made. Generally speaking, a cotton of ⅞-inch staple is used. In the first division of mills the mixing would be done by hand, but in the second division the equipment would probably include a bale breaker, and unless the mixing was pressed for the cotton would be run through this machine, and as this machine will take care of 80,000 pounds of cotton there is not much danger of it being overworked.

THE MIXING

should be as large as possible and in the lower grades of flannelette the mixing would include a small percentage of comber waste, as well as the good sliver waste from the cards, drawing frames and comber rooms (if equipment contains same). The better grades of flannelette would not use waste. Roving waste would be used in both mixings, but this stock would not be mixed until the finisher picker process, and here the waste should not be mixed in a greater proportion than 1 to 4. In the modern equipments of mills generally only two processes of picking, with an opener, are used; but as there are a great many mills, which use three processes of picking, the particulars will be given for

THREE PROCESSES OF PICKING.

For this class of goods the rigid type of beater is used on all picking machines. Keep the hopper of the opener more than half full to help obtain an even lap. The speed of the beater of

the opener should be about 1,000 revolutions per minute. This machine is generally used in connection with the breaker picker, and after the cotton has passed the beater, it is passed under a pair of wooden rollers onto an endless lattice which carries it to the feed rolls of the breaker picker. The speed of the beater of this machine should be about 1,500 revolutions per minute and the weight of the laps at the front about 40 pounds or about 16 ounces to the yard.

THE DOUBLINGS

of the intermediate picker should be four into one and the speed of this beater should be the same as the finisher picker, or 1,450 revolutions per minute. The speed of the fan at this machine should be about 1,050 revolutions per minute. The speed of the driving shafts on this and on the finisher picker should be about 375 revolutions per minute. The weight of the lap at the front should be a little less than at the breaker, or about 37 pounds or a 12-ounce lap. The same particulars may be used for the finisher picker with the following exceptions: Speed of fan, 1,100 revolutions per minute and the weight of the lap about 39 pounds or about a 14-ounce lap. These particulars will answer for both warp and filling. The lap is put up at the card which should have a draft of about 100. Set the doffer to a 5-gauge and use as large a doffer as possible, either a 26 or 27 inch. The

PRODUCTION OF A CARD

for this class of work should be about 800 pounds, with a 65-grain sliver, for a week of 60 hours. On this class of goods no combing is used, but a three-process drawing. See that the proper weights are attached to the top rolls. The doublings are generally six into one, although eight into one are used in some mills. Don't draw more than you double. The draft should be about 5 at each process; speed of front rolls 400 revolutions per minute. Watch your settings of the top rolls at these machines. The hank roving made at the slubber should be about .55. Only one process of fly frames is used for warp, the hank roving being made about 2. Use square root of hank x 1.1 for twist. For the filling, two-proccess of fly frame is used, the hank roving being 2 at the first intermediate and 3.75 to 4.00 hank at the 2d intermediate. Use square root of hank x 1.2 for twist. The roving is now carried to

THE SPINNING ROOM

where it is made into the required count of yarn. For 14s warp yarn use the following particulars for spinning frame: Size of spindle, any first class; gauge of spindle, 3 inches; diameter of ring, 2⅛ inches; length of traverse, 7 inches. For this class of goods a soft twist is used for the warp yarn, as little as possible being put in, but be sure and put in enough so that the yarn will not break back in the loom. For a filling frame for 30s yarn use as follows: Gauge of spindles, 2¾ inches; diameter of ring, 1½ inches, length of traverse, 6½ inches. The warp yarn is then spooled, warped and put through the slasher.

Dyeing Particulars.

SKY BLUE.

½ per cent eboli blue 6 B; 20 per cent Glauber's; 2 per cent sal soda.

PINK.

½ per cent dioxyrubine G; 20 per cent Glauber's; 2 per cent sal soda.

YELLOW.

½ per cent fast cotton yellow C, extra; 20 per cent Glauber's; 2 per cent sal soda.

SCARLET.

3 per cent diamine scarlet B; 30 per cent Glauber's; 3 per cent sal soda.

WINE.

4 per cent diamine Bordeaux B; 30 per cent Glauber's; 3 per cent sal soda.

RED.

4 per cent diamine fast red F; 30 per cent Glauber's; 3 per cent sal soda.

CINNAMON BROWN.

3 per cent diamine brown 3 G; 30 per cent Glauber's; 3 per cent sal soda.

BLACK.

15 per cent pyrogene black B; 20 per cent sodium sulphide; 3 per cent soda ash; 40 per cent Glauber's.

DARK BROWN.

4 per cent chrysophenine; 2 per cent benzo fast black; 2½ per cent benzo fast red L; 30 per cent Glauber's; 3 per cent sal soda.

MYRTLE GREEN.

3 per cent benzo green G G; ½ per cent chrysophenine; ½ per cent benzo fast black; 30 per cent Glauber's; 3 per cent sal soda.

SLATE.

1 per cent benzo fast black; ½ per

cent benzo fast blue B N; ⅛ per cent benzo fast red L; 30 per cent Glauber's; 3 per cent sal soda.

HELIOTROPE.

2 per cent tetrazo lilac B; 30 per cent Glauber's; 3 per cent sal soda.

NAVY BLUE.

5 per cent tetrazo indigo blue C; 30 per cent Glauber's; 3 per cent sal soda.

ORANGE.

3 per cent tetrazo chlorine orange R; 30 per cent Glauber's; 3 per cent sal soda.

LEMON YELLOW.

1½ per cent tetrazo lemon yellow; 30 per cent Glauber's; 3 per cent sal soda.

DENIM.

Denim is a strong, medium-weight, single-cloth fabric, weighing from 4½ to 5 ounces per yard and composed of single cotton yarn in warp and filling.

It is usually made with a small, uneven-sided twill weave, such as $\frac{2}{1}$ 45° twill, and in solid color warp effects, generally indigo blue or dark brown, and white filling. White selvedge is used in all grades.

A grade known as covert cloth is made of twist yarn in the warp, and dark colored, single filling. The twist yarns are usuallly blue and white and the cloth of a similar texture to that of the regular denim.

In effect denim is a stout, twilled fabric, having excellent wearing qualities, and is made to sell at 10c. to 15c. per yard, retail. It is used principally in the manufacture of overalls, to be worn by workmen who operate machinery, or by those who perform hard, rough labor of any description.

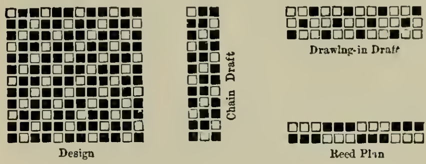
Denim can be woven in any single box roller loom, such as Mason, Lowell, Lewiston, Colvin, etc., the warp being prepared on the slasher, in the same manner as a sheeting warp. It is then drawn in on the harness or heddles, in accordance with weave desired.

The finish of this fabric is a rather heavy sizing, after which the goods are dried and pressed.

Denim is sometimes dyed in the piece, in light shades of tan, blue, etc., and the goods made up into summer outing skirts for ladies' wear.

1 square in. equals 2.6 grains. 27 x 36 equals 972 x 2.6 equals 2,527.2 divided by 1 equals 2,527.2 divided by 437.5 equals 5.77 ounces per yard, 27 inches wide finished.

20 pieces blue warp x 1 inch equals 20 inches equals .5 grains. 20 x 7,000 equals 140,000 divided by .5 equals 2,800,000 divided by 36 equals 7,777.77 divided by 840 equals 1-9s warp.



15 pieces white filling x 3 inches equals 45 inches equals .65 grains. 45 x 7,000 equals 315,000 divided by .65 equals 484,615 divided by 36 equals 13,461.43 divided by 840 equals 1-16s filling.

CONSTRUCTION.

$\frac{2}{1}$ twill 45°

68 ends per inch finished and 42 picks per inch finished equals 63 ends in reed and 40 picks in loom.

Reed 750—29 inches—3 ends per dent. 10 per cent take-up—32 ends selvedge. 40 picks, 1-16s white cotton filling.

1,836 ends blue yarn and 32 ends white yarn selvedge equals 1-9s cotton warp.

1,836 + 32 equals 1,868 + 10 per cent take
= 2,076 yards 1-9 warp =................4.39 ozs.
42 picks x 27 inches = 1,134 yards 1-16
filling =...................................1.35 ozs.

5.74 ozs.

Carding and Spinning Particulars.

Denim is constructed of yarns that are made in either the first or second divisions of mills as given in a previous lesson. In the second divison of mills the raw stock would be run through a bale breaker, as this class of mills would undoubtedly contain this machine in their equipment. In the first division of mills the mixing would be done by hand. When bale breakers are used, it is of great advantage to have a blower in connection with them. This blower is generally placed at the delivery end of the machine and blows the cotton, after it has passed through the bale breaker, through trunking onto an endless lattice which deposits it in the mixing bins. A blower is of advantage because it opens the cotton and the current of air helps to dry it and the cotton does not have to dry out in the

mixing bins as is the case when a blower is not used. Mixing is

A VERY IMPORTANT PART

of the card room and too little attention is generally given to it. It will be understood that if the cotton is not properly mixed, this defect cannot be remedied at any subsequent machine. Cotton of the same length of staple should always be used, cotton of the same nature, and where waste is used the percentage should be as small as it is possible to make it. The same mixing may be used for making of both the warp and filling yarns, a medium to low grade being used of a staple length of about one inch (ranging from ⅞ to 1⅛ inches, according to the quality of denim being made). A small percentage of comber waste may be used, but is not advisable. The good sliver waste from the cards and drawing frames is mixed with the raw stock and the roving waste is mixed in the manner described in a previous article. The cotton would be put through two processes of picking and an opener. Keep the hopper of the opener well filled with cotton so that the lifting apron will always be carrying up a full load of cotton to the pin roller. The

SPEED OF THE BEATER

of the opener should be about 1,050 revolutions per minute, the speed of the fan being about 350 revolutions per minute. If porcupine beater is used, the speed should be about 1,150 revolutions per minute. The speed of a two-bladed beater of a rigid type of the breaker picker should be about 1,500 revolutions per minute, the speed of the fan being about 100 revolutions less. The total weight of the lap at the head end should be about 40 pounds, or 20 ounces to the yard. The doublings at the finisher picker are 4 into 1 and the speed of the beater (2 bladed rigid type), 1,450 revolutions per minute, which will beat the cotton sheet presented to it about 42 times per inch in length. The weight of the lap in the front should be as heavy as possible and at the same time not overwork the card. A good weight would be 39 pounds or a 14-ounce lap (for a 38 inch lap). The

DRAFT OF THE CARD

should not exceed 100 and should be not less than 90. The sliver should weigh 65 grains per yard and the production about 850 pounds for a week of 60 hours. Keep your card wire sharp and be sure that your top flats are ground even, because close and accurate settings cannot be obtained when the wire on the flats is not of a uniform length. Large doffers should also be used. The sliver would then be put through two processes of drawing frames, the speed of the front roll (1½ inches diameter) being 400 revolutions per minute on each set. The draft should not be more than the doublings and the sliver should weigh about 70 grains per yard.

THE PRODUCTION

being about 260 pounds per delivery per day of 10 hours. When metallic rolls are used, the production would be considerably greater or about 350 under the conditions noted above. Metallic rolls are coming more and more into use, especially on the lower counts of yarns, and also on a heavy sliver; although they can be used on all grades and lengths of staple, they are not generally used, but not through any fault of the rolls, as they are suitable for producing fine work. The slubber draws the sliver into .55 hank and the one-process fly frames used makes the roving into a 1.75 hank roving. Sometimes two different hanks are made at the fly frame, one for the warp and one for the filling yarns; where this is the case, the warp yarn is made from one hank roving and the filling from 2.00 hank. The particulars for the warp spinning frame for No. 9s are as follows: Front roll, one in. diameter; gauge of frame, 3 in.; diameter of ring, 2¼ in.; length of traverse, 7 in.; for a filling frame making 16s use gauge of frame, 2⅜ in.; diameter of ring, 1⅝ in.; length of traverse, 6½ in. The warp yarn is then spooled, warped and put through the slasher.

Dyeing Particulars.

BLUE.

6 per cent katigen indigo B; 6 per cent katigen indigo 5 G; 12 per cent sulphide sodium; 4 per cent soda ash; 30 per cent salt; after treat with 1½ per cent bichrome, 2 per cent copper sulphate and 4 per cent acetic acid. Rinse well and soap.

BLACK.

15 per cent immedial black N N; 15 per cent sodium sulphide; 30 per cent Glauber's salt; 4 per cent soda ash. Rinse well and soap.

BROWN.

6 per cent thion brown G; 6 per cent thion brown B; 2 per cent thion yellow R; 14 per cent sulphide sodium; 4

per cent soda ash; 30 per cent salt; after treat 3 per cent bichrome, 3 per cent sulphate copper; 5 per cent acetic acid. Rinse well and soap.

SLATE.

5 per cent pyrogene black B; 5 per cent sodium sulphide; 2 per cent soda ash; 20 per cent salt. Rinse well and soap.

DARK GREEN.

10 per cent immedial green G; ½ per cent immedial black N B; 10 per cent sulphide sodium; 4 per cent soda ash; 30 per cent Glauber's salt. Rinse well and soap.

RED.

8 per cent diamine fast red F; 30 per cent Glauber's salt; 3 per cent soda crystals. Rinse and after treat 2 per cent fluoride chrome at 160 degrees F.

BOURRETTE.

Bourrette is a light weight, single cloth fabric, weighing from 4½ to 6 ounces, composed of two-ply cotton warp, and either wool, merino or a combination of cotton and wool shoddy filling. Both the warp and the filling have an occasional end or pick of fancy bourrette or nub yarn added for effect; hence the name.

In appearance bourrette cloth is a semi-rough-faced woolen fabric, having small fancy colored lumps on the yarn, scattered throughout the goods in accordance with the effect desired. The cloth when finished is used principally in the manufacture of ladies' fall suitings.

THE WEAVE

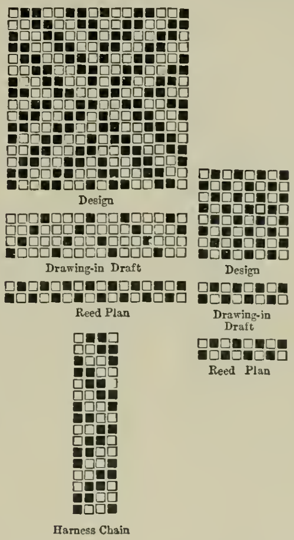
is usually a $\frac{1}{1}$ plain weave, or a mixed twill effect, such as can be produced from the regular $\frac{2}{2}$ 45 degrees twill, viz.: diamond or entwining twill weaves. These weaves, in connection with certain warp and filling patterns, such as 1 black, 1 fancy twist or 2 black, 2 fancy twist, create very elaborate styles, as this color arrangement serves to hide the rigid outline of the design, and thus has a tendency to complicate the general appearance of the weave used in the fabric.

The fancy effects in twist that can be adapted to this line are made by twisting the following colors together, viz.:

Black and white.
Black and light blue.
Black and light green.
Black and old gold.
Black and red.
Black and light brown.

These twist yarns serve the purpose of brightening up the general appearance of the goods.

Bourrette cloth can be woven in any power loom, excepting those styles



wherein a single pick of the fancy yarn is introduced in the filling, in which case the Knowles 4x4 pick and pick dobby loom is very serviceable.

TO FINISH THIS FABRIC,

the goods are taken from the loom and measured, after which they are brushed then scoured in a solution of soap and cold water, then tentered and dried and pressed.

The bourrette yarn is made by twisting two cotton threads and a worsted thread together, the worsted being allowed to deliver more quickly than the cotton threads, at regular intervals.

The excess which is delivered is twisted around the cotton threads in the one place, thereby forming a lump on the twisted yarn, as the worsted yarn is run at a varied speed, and is not regularly distributed around the cotton threads.

CONSTRUCTION.

4 square inches equals 7.61 grains.
33x36 equals 1,188 times 7.61 equals

904,068 divided by 4 equals 2,260.17 divided by 437.5 equals 5.11 ounces, 33 inches wide from loom.

23 pieces black warp times 2 equals 46 inches equals 1.41 grains.

46x7,000 equals 322,000 divided by 1.41 equals 228,368 divided by 36 equals 6,343.5 divided by 840 equals 2-14s.

22 pieces twist warp times 2½ equals 55 inches equals 2 grains.

55x7,000 equals 385,000 divided by 2 equals 178,804 divided by 36 equals 5,216.8 divided by 840 equals 2-12s.

30 pieces black merino filling times 2 equals 60 inches equals 3 grains.

60x7,000 equals 420,000 divided by 3 equals 140,000 divided by 36 equals 3,888 divided by 300 equals 1-12s cut.

10 per cent up.

Reed,400 minus 1 end per dent minus 36 inches wide, including selvedge of 16 ends 2-14s black, 24 picks, 1-12 cut merino equals 75 per cent wool and 25 per cent cotton.

Warp pattern: 1 black equals 2-14s cotton; 1 twist equals 2-12s cotton.

24 picks times 36 equals 864 yards 1-12 merino equals 3.84 ounces.

192 ends black plus 16 equals 208 plus 10 per cent take-up equals 231 yards 2-14s equals 6.28 ounces; 192 ends twist plus 10 per cent take-up equals 213 yards 2-12s equal .676 ounces, total, 5.144 ounces per yard loom.

Finish—Scour, tenter and steam press, to loom width.

Carding and Spinning Particulars.

In the class of goods under description it will be noticed that there is a very small percentage of cotton contained in its make up. If the cotton yarn that this class of goods contains was made in a cotton mill, the following particulars would be a good foundation on which to base the speeds, weight and processes through which the raw stock would have to pass before being turned out into 2-ply 12s or 2-14s yarn, as the case may be. This class of yarn may be made in the first division of mills, and the cotton would be hand mixed and put in the bins. The mixing should be allowed to dry out as much as possible before using, and a better plan would be to have two large mixing bins so that when one was in use the other one might be filled and the cotton dried. This is not always done, because most picker rooms are pressed for floor space.

THE RAW STOCK

should be put through two processes of picking and an opener. The good waste from pickers, cards and drawing frames should be put into the mixing bin before running it through the opener. Always keep the hopper of the opener more than half full and gauge your stripping roller so that quite a heavy weight of cotton is passed to the action of the beater. The speed of the beater for the opener should be about 1,000 revolutions per minute, the speed of the fan about 350 revolutions per minute. This machine is used in connection with the breaker picker and the speed of the beater (2 bladed rigid type) should be about 1,500 revolutions per minute. The weight of the lap at the front should be about 40 pounds or a 20 ounce lap to the yard. The laps from the breaker picker are put up at the finisher picker and doubled 4 into 1. The speed of the beater at this machine should be about 1,450 revolutions per minute, which gives about 42 blows per inch of cotton fed. The

WEIGHT OF THE LAP

should be about 40 pounds or a 14½ ounce lap. Care should be taken to see that the variation in the total weight of the laps delivered at the front of the finisher picker is not more than three-quarters of a pound from standard weight for raw stock to make goods under description,and the amount of variation for the finer classes of goods should not exceed one-half a pound from standard. When laps are found to vary more than above noted, they should be placed at the back of the finisher picker and run over. If a great degree of variation is found, i. e., if the standard is 40 lbs., and laps are delivered which weigh 39¼, 41, 39, 40¾, and so on, it shows that the picker needs adjustment, and on all makes of machines there are devices to regulate these small variations. The laps are put up at the card and the draft of this machine should not exceed 100.

THE WIRE FILLET

should be coarser, so as to stand the pressure of the weight and amount of cotton to be passed through. This wire should be kept sharp by frequent grindings with the grinding rollers. The weight of the sliver should be about 65 grains to the yard and the production of a card for 60 hours on this class of goods should be not less than 850 pounds. The cotton is put through two processes of drawing. The speed of the front roller in each case should be 400 revolutions per minute. On this grade of cotton it would be of

great advantage if metallic rolls were used. The weight of the sliver at the front of the finisher drawing frame should be about 70 grains to the yard. The sliver at the drawing frames should be weighed about three times a day to see that it is the proper weight. The slubber roving should weigh about .50 hank. Only one process of fly frames is used and the hank at this should be about 1.50. The roving is then carried to

THE SPINNING ROOM,

when it is spun to the required count yarn. The particulars to spin 12s on a warp frame are as follows: gauge of frame three inches; diameter of ring. 2⅛ inches; length of traverse, 7 inches; twist per inch, 16.45; speed of spindle, 9,000 revolutions per minute. The same particulars may be used for making 14s yarn with the following exceptions, that somewhat different particulars are required for the spinning frame. The warp yarn is then spooled and taken to the twister when it is made into 2-ply or 2-14s as the case may be, after which it is sized at the slasher.

Dyeing Particulars.

BLACK.

10 per cent immedial brilliant black B, 10 per cent sulphide sodium, 3 per cent soda ash, 30 per cent Glauber's.

For the threads of colored yarn which are mixed with the black and white, fast sulphur colors are dyed.

For union yarn a one-dip aniline union black is generally dyed.

LIGHT BLUE.

10 per cent pyrogene indigo, 20 per cent sulphide sodium, 10 per cent soda ash, 35 per cent salt, 3 pints mineral oil.

LIGHT GREEN.

8 per cent pyrogene green G, 16 per cent sulphide sodium, 6 per cent soda ash, 30 per cent salt.

OLD GOLD.

4 per cent pyrol bronze, 2 per cent pyrol yellow, 6 per cent sulphide sodium, 3 per cent soda ash, 30 per cent Glauber's.

RED.

5 per cent benzo fast red, 3 per cent sal soda, 30 per cent Glauber's.

LIGHT BROWN.

10 per cent thion brown G, 10 per cent sulphide sodium, 3 per cent soda ash, 30 per cent Glauber's.

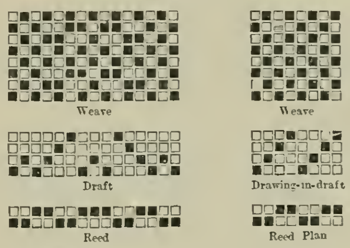
OLIVE.

4 per cent immedial olive 3G, 1 per cent immedial cutch O, 3 per cent soda ash, 30 per cent Glauber's, 5 per cent sulphide sodium.

FANCY SHIRTING.

Fancy shirting is a light-weight, single cloth wash fabric, weighing from two to three ounces per yard, and composed of regular, single, cotton yarns, 1-26s to 1-40s in warp and filling.

It is made in simple stripe patterns either printed on the woven, bleached



Idea for fancy weave

fabric, or of fast colors, dyed upon the warp. Combinations of each are sometimes formed to create attractive styles.

THE WEAVE

used is either the plain $\frac{1}{1}$ or this combined with a fancy rib or basket weave.

Fancy shirting is made to retail at 8 to 12½ cents per yard, and is used in men's outing and working shirts, ladies' and children's waists, blouses and summer suits. It is from the consumer's standpoint a practically inexpensive material, which, when the garment becomes soiled, can become a part of the family wash and be readily renovated.

Those grades in which the plain weave alone is used are best adapted to the plain single box roller room. The fancy styles,in which a more elaborate weave effect is desired, require a loom having a dobby or witch top attached. The Knowles 1x1 loom, hav-

ing a Stafford dobby top, is very popular for this style of cloth.

THE FAST WARP COLORS,

generally used in connection with the bleached or white yarns to create a range of patterns for this fabric, are: Dark blue, dark green, black, red, lavender, pink, ecru, tan, light green, light blue and violet.

FINISHING.

To finish this fabric the goods are taken from the loom and run through the washer, after which they are very lightly sized, then dried by the process of tentering (this also prevents undue shrinkage in width). After drying run through the calender to press out wrinkles,also to bring up a clear, even face. Then the goods are ready to lap and fold in readiness for the shipper.

CONSTRUCTION.

4 square inches equals 4.18 grains.

27x36 equals 972x4.18 equals 4,062.96 divided by 4 equals 1,015.74 divided by 437.5 equals 2.319 ounces per yard, 27 inches wide.

12 pieces blue warp times 1½ equals 18 inches equals .16 grains.

18x7,000 equals 126,000 divided by .16 equals 787,500 divided by 36 equals 21,-878 divided by 840 equals 1-26s blue warp yarn (cotton).

12 pieces white warp times 1½ equals 18 inches equals .16 grains.

18x7,000 equals 126,000 divided by .16 equals 787,500 divided by 36 equals 27.-878 divided by 840 equals 1-26s white warp yarn (cotton).

19 pieces white filling times 2 equals 38 inches equals .25 grains.

19x7,000 equals 266,000 divided by .25 equals 1,064,000 divided by 36 equals 29,833 divided by 804 equals 1-36s white filling yarn (cotton).

27 inches finished.

Reed, 1,150 minus 29 inches minus 2 ends per dent; 54 picks minus 1-36s white cotton filling; 1-26s cotton warp; 10 per cent take-up; 1,858 ends in warp plus 32 white selvedge.

WARP PATTERN.

3 white.
*1 light blue } 7 times.
3 white. }
1 light blue.
3 white.
2 white in 1 heddle.
8 light blue.
2 white in 1 heddle.

47 ends per pattern, 39 repeats of pattern plus 25 ends. Start at *.

16 blue ends per pattern times 39 repeats equals 624 plus 7 equals 631 blue ends.

31 white ends per pattern times 39 repeats equals 1,209 plus 18 plus 32 ends selvedge equals 1,250 white ends.

631 blue ends 1-26s plus 10 per cent equals 701 yards equals .513 ounces; 1.250 white ends 1-26s plus 10 per cent equals 1,388 yards equals 1.001 ounces; 54 picks times 29 1-36s filling equals 1,-566 yards equals .828 ounces; total, 2.-342 ounces.

Finish, wash, size, calender.

Carding and Spinning Particulars.

The fabric known as fancy shirting is made up of yarns, the counts of which vary from 20s to 60s, according to the mills making them, and also according to the grade being made. For the particulars that will be described below we will consider that the shirtings are made up of 1-26s warp and 1-40s filling. It is not customary for both yarns to be made out of the same length of staple or grade of cotton, although in some instances this may be done. For the 40s yarn a good grade of raw stock of about 1¼ to 1⅜ inches stock should be used and for the 20s yarn a cotton of about 1 1-16 to 1 3-16 inch staple may be used with advantage. The raw stock in both cases should be put through the bale breaker and deposited in their different bins, being allowed to stand as long as possible before using. This is for the purpose of drying out the cotton as it is easier to work when in this condition. An opener and two processes of picking are generally used, although it is the custom in many mills to use three processes. When the latter is the case,the particulars given for the finisher picker may be used,except that the speed of the fan is not so great, also that the laps are of a little lighter weight. The hopper of the opener should be kept well filled so that an even amount of cotton will be always fed to the feed roll of the breaker picker. The speed of the beater (2 bladed rigid type) should be about 1,000 revolutions per minute; the fan, about 350 revolutions per minute. The speed of the beater of the breaker should be about 1,500 revolutions per minute and for the finisher picker 1,-450 revolutions per minute. This gives the cotton passing through about 42 beats per inch. The weight of lap at the breaker picker is 40 pounds, or 16 ounces to the yard. At the finisher (and intermediate picker if used) the doublings are four into one. The roving cut waste is mixed at the back of

the finisher picker in the usual manner. The weight of the laps at the delivery end of the finisher picker is 35 pounds for the longer stapled cotton and 39 pounds for the shorter, or a 12½ ounce lap for the filling yarn and a 14½ ounce lap for the warp yarn. The cards are set about the same in both cases, except where they are required to be set according to the length of staple.

The draft of the card should not exceed 100 for the warp yarn and should not be less than 100 for the filling yarn. As large a doffer as possible should be used with both stocks, and the weight of the sliver should be about 65 grains. The production would be 750 pounds per week of 60 hours for the filling cotton and 850 pounds for the warp yarn. Always keep the wire sharp and never under any circumstances allow it to become dull. Grind cylinder and doffer wire at least once a month for half a day and grind top flats twice a month with "dead roller." Strip cards three times a day, both cylinder and doffer. Some overseers strip cylinders twice and doffers three or four times. This, they claim, saves time as the doffer may be stripped while running and the sliver is not as uneven as when both doffer and cylinder are stripped at the same time. In the mills making fine yarns it is the general custom to strip three times a day. Three processes of drawing are used for both warp and filling. The only difference made in these machines is that the rolls are spread differently for the different lengths of staple. The weight of the sliver should be about 70 grains in both cases.

The slubber makes this sliver into 50 hank roving, the standard twist being obtained by multiplying the square of the hank roving by the constant 1. On the finer classes and long stapled cotton the front top rolls of the slubber are varnished, but this class of goods does not require this to be done. The roving for the warp yarns is put through two processes of fly frames, the hank at the first intermediate being 1.50 and at the second intermediate 3. The filling roving is put through two processes of fly frames, the hank roving at the first intermediate being 2, and at the second intermediate 5. The twist standard is obtained by multiplying the square root of the hank by 1.1 for both cottons. Take special care of your top rolls to see that they are in perfect condition and not channeled, cut, uneven, oil soaked, dry at the bearings, loose or unevenly weighted. Look out for the settings of all fly frame rolls. The roving is carried to the spinning room, where it is drawn into the required count. For 26s count warp yarn a frame with the following particulars may be used: Gauge of frame 2¾ inches, diameter of ring 1¾ inches, length of traverse 6½ inches, twist per inch 24 plus, speed of spindle 9,700 revolutions per minute. For a filling making 40s, the particulars have been given in a previous lesson. The warp yarn is then spooled, warped and run through a slasher.

Dyeing Particulars.

DARK BLUE.

5 per cent immedial blue C, 5 per cent immedial blue C R, 1 per cent immedial black N N, 10 per cent sodium sulphide, 30 per cent Glauber's, 3 per cent soda ash.

DARK GREEN.

15 per cent thiogene green B, 15 per cent sodium sulphide, 3 per cent soda ash, 30 per cent Glauber's.

BLACK.

15 per cent melanogen black G, 15 per cent sodium sulphide, 3 per cent soda ash, 30 per cent Glauber's.

RED.

6 per cent primuline, diazotized and developed with Beta naphthol.

LAVENDER.

¼ per cent diamine blue, 3 R pat., after treated with ½ per cent sulphate of copper at 160 degrees F.

PINK.

½ per cent diamine rose B D, 30 per cent Glauber's, 3 per cent sal soda.

ECRU.

2 per cent katigen yellow brown G G, 2 per cent sodium sulphide, 20 per cent Glauber's, 2 per cent soda ash.

TAN.

5 per cent thion brown G, 5 per cent sodium sulphide, 2 per cent soda ash, 20 per cent Glauber's.

LIGHT GREEN

on a tannin and tartar emetic mordant. Dye ½ per cent thioflavine T, ½ per cent new methylene blue G G.

LIGHT BLUE.

2 per cent immedial sky blue, 2 per cent sodium sulphide, 2 per cent soda ash, 20 per cent Glauber's.

VIOLET.

1 per cent diamine blue 3 R pat., after treated with ¾ per cent sulphate of copper at 160 degrees F.

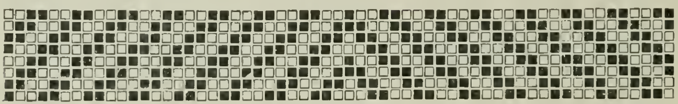
TAPE.

Tape is a very narrow fabric, composed of either cotton or linen yarns in warp and filling, and usually made with a point or broken twill weave, the break in the weave occurring in the centre of the tape, and the twill lines running in a right and left hand direction.

It is made of all bleached yarns. It is made of regular yarns about 1-26s to 1-30s and 1-40s cotton and is used as a trimming, in the manufacture of clothing, also used as a binding in innumerable cases, such as paper boxes, etc., and is sold by the roll, each roll containing a certain number of yards.

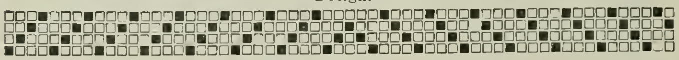
A fair grade of tape weighs about 20 yards per pound.

This fabric is woven in a broad loom having a light dobby head motion attached, similar to that which is used on a hair cloth loom.

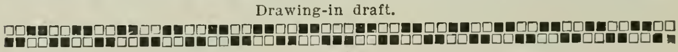


Design.

Weave



Drawing-in draft.



Reed plan.

In weaving this fabric, the loom is arranged to produce several rolls at the same operation, it being very narrow. There are perhaps 20 rolls all weaving at once, as the warp yarn for each roll is beamed upon a small spool, thereby acting independently of every other roll on the same loom. The warps are all drawn through the same harness or heddles, which are worked from the dobby motion.

The peculiar and important part of a tape loom is the filling arrangement or shuttle motion.

Being a one shuttle fabric, each warp has its separate shuttle, all the shuttles being operated at the same time, and by one motion. The shuttle, in traveling from one box to its mate, describes a half moon movement, and this is accomplished by a sliding rod beneath the race board, and so set that at each pick of the loom the rod moves from left to right and on the next pick right to left, and for each piece of tape being woven there must necessarily be a shuttle, and for each shuttle there is an attachment placed on the aforesaid rod in such a position that the rod in moving causes the said attachment to move the shuttle from one box to the other in the same direction as the rod is taking.

Tape requires as a finish, washing and drying on the cylinder, after which it is wound into rolls and is ready to pack and ship.

CONSTRUCTION.

Reed, 1,650 minus ⅝ inches width in reed, 59 ends, 46 picks, $\frac{2}{2}$ point twill, 30 ends minus 29 ends left.

Carding and Spinning Particulars.

The counts of yarn used to make tape vary from 20s to 40s, according to the grade of tape required. In this article we will consider the warp yarn to be 1-36s and the filling 1-40s. These counts of yarn would be made in the second division of mills as given in a previous lesson. For this fabric the yarn would be made out of a medium grade cotton of from 1 to 1¼ inches in length. The bales of raw stock would be brought to the mixing room and stapled and those bales of the same length of staple would be opened and run through a bale breaker (if the mill contained one, or through a willow, or it may be mixed by hand) and passed by suitable means to

THE MIXING BIN.

It should be allowed to stand here as long as possible, so that the cotton may be opened up to the air, which dries it, and makes it easier to work than when it is not allowed to stand in the bins. At this point the good waste from the pickers, cards and drawing frames should also be mixed in with the raw stock. The cotton is then put through an opener and either two or three processes of picking, generally two. If three processes of picking are used, the intermediate process presents almost the same particulars as the finisher picker. In this instance, we will consider that only

TWO PROCESSES OF PICKING

are used. The hopper should be kept as nearly full as possible, so that an even lap may be made. The cotton is fed to the feed rolls of the breaker picker and after passing comes under the action of the beater which, if it is a rigid two-bladed type, should make about 1,450 revolutions per minute, the speed of the fan being about 1,050 revolutions per minute. The weight of the lap at the front should be about 40 pounds or a 12-ounce lap. The doublings at the finisher picker are 4 into 1. The speed of the fan should be about 1,450 revolutions per minute, and the fan 1,100 revolutions per minute. This gives the cotton sheet about 42 beats per inch fed. Watch your drafts. The weight of the lap at the front should be about 39 pounds or a 14½ ounce lap. When roving waste is mixed with the raw stock, it should first be put through

A SPECIAL PROCESS

to take out the twist, and through a breaker picker to make laps, and these laps are put up behind the finisher picker. These laps are mixed with the raw stock in a proportion of one lap roving waste to three laps of raw stock. The laps are put up at the card, the draft of which should not be less than 100. In speaking of cards we refer to the so-called English card and not the American card. The wire fillet of this card should be about No. 34 wire on cylinder and No. 35 wire on doffer and flats. This is equivalent to 110s and 120s, English count, and gives 79,200 points per square inch for cylinder and 86,400 points per square inch for doffer and top flats. Grind the wire so as to keep it sharp and strip three times a day.

THE SLIVER

at the front of the card should weigh about 65 grains per yard and a production of 800 pounds should be turned off for a week of 60 hours.

Use as large a doffer as possible, either a 26 or 27 inch one. The sliver is put through three processes of drawing frames, doubling six into one, the speed of the front roll being 400 revolutions per minute, and the weight of sliver at the finisher drawing 70 grains to the yard. Always keep a stock of freshly varnished rolls on hand, so that if those in the frames become worn or damaged in any way they may be replaced at once. All the rolls should be varnished and changed at least once every two weeks. Drawing frames should be cleaned at least once a month. The

SETTINGS OF THE DRAWING FRAME ROLLS

should be looked after frequently to see that they have not slipped. The sliver is then passed to the slubber which draws and twists it into .50 hank roving. Watch your leather covered rolls to see that they are perfect. The roving is then put through three processes of fly frames, the hank roving at the first intermediate being 1.50 and at the second 3.50 hank and at the jack, 9. to 9.50 for both counts of yarn, the doublings being two into one in every case. Use the standard multiplier for twist previously given. The roving is then taken to the spinning room and made into the required count. The particulars for a warp yarn of 36s count are as follows: Gauge of frame, 2¾ inches; diameter of ring, 1⅝ inches; length of traverse, 6½ inches; speed of spindle, 10,200 revolutions per minute.

MERCERIZED VESTING.

Mercerized vesting is either a light or heavy weight cotton wash fabric weighing from 5 to 8 ounces per yard, finished, and is made of one, two or three warps and one or two fillings. When made of one warp and filling, a light weight can be produced in case the warp and filling are both mercerized yarns.

The warp for the face of the cloth ranges from 2-20s to 2-60s mercerized cotton, and the filling from 1-10s to 1-16s cotton.

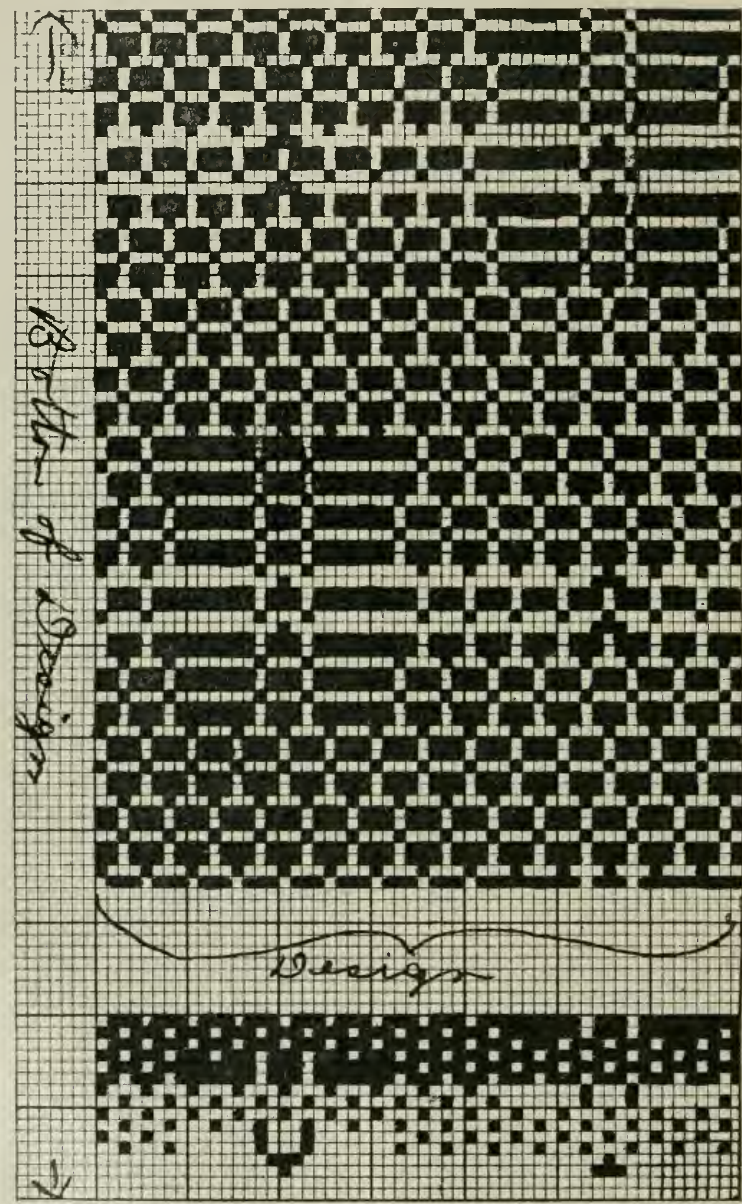
The styles range from granite and basket weave effects in solid white, to the more elaborate figured patterns, such as are created by forming spots on the face of the cloth, from warp effect diamond, cross and curved twill weaves, so arranged as to scatter the design in regular formation, in imitation of jacquard designs.

ADDING WEIGHT.

The extra back warp is for the purpose of adding weight to the fabric, also permitting greater scope in face weave effects, the idea being to so arrange the face weave as to thoroughly cover the coarse filling, the back warp binding the filling into the cloth, under the figure floats of the face weave.

In making a vesting having a back warp, always use a two-ply yarn for this warp, as a single yarn will bead

in the weaving, which means a loss of time every few hours in removing same, and the warp will not shed properly when the yarn is beaded, which causes the reed to cut the yarn. The quickest way to remove the beads from the yarn in the shed is to loosen the top of the reed cap, and lay the reed upon the cloth. The beads may then be either cut off, or drawn through the reed. If the latter method is used, the beads form a line of small lumps upon the face of the cloth, from one selvedge to the other. While this in itself is not a serious imperfection, it means that the cloth must be cut at this point



Harness Chain.

to remove the lumps, which to a certain extent destroys the utility of the piece in manufacturing the garments.

EITHER A DOBBY OR JACQUARD.

This fabric can be woven on either the dobby or jacquard loom. Most of the popular imported jacquard effects can be imitated successfully on the dobby loom, having either single or double box filling motion. It is best adapted to the Knowles Gem Harness loom, or the Fairmount, 4x1, box loom, having the Ingraham head motion attached.

To finish this fabric, the cloth goes from the loom to the measuring machine, after which it is scoured, during which operation the goods are run through a solution of soap and cold water to remove all stains such as mill dirt and grease spots. After washing it is calendered or pressed, and each piece is folded and doubled up in heavy paper and tied with a cheap tape. It is then ready to pack and ship.

A style having great vogue in the spring of 1904 was a mixed effect, produced by using an all white mercerized warp, and black mercerized filling, the ground weave being 1 up, 1 down and the figure, small, double-headed triangles.

Reed, 700 minus 30 inches in reed 1 ends per dent in reed; 2-20s white mercerized warp, 2-20s black mercerized filling; 48 picks. Weight about 7½ ounces.

CONSTRUCTION.

62 ends face finished, 31 ends back finished, equals 93.

1 square inch equals 3 grains; 60 picks finished; 29x36 equals 1,044x3 equals 3,132 divided by 1 equals 3,132 divided by 437.5 equals 7.16 ounces per yard.

$\frac{2}{\ 1}$ face ends, back ends.

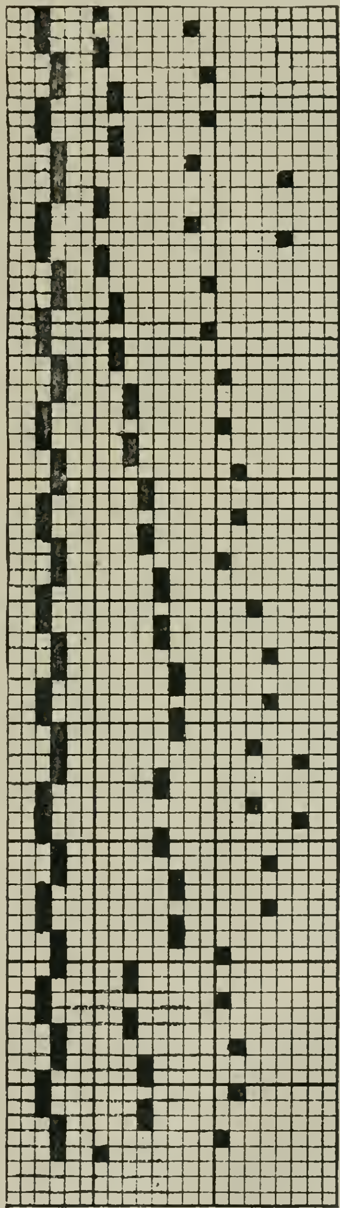
30 inches in reed including selvedge; 29 inches finished. Scour and calender.

16 pieces mercerized face yarn times 3 inches equals 48x7,000 equals 336,000 divided by .95 grains equals 353,684 divided by 36 equals 9,824.5 divided by 840 equals 11.69 or 2-20s mercerized yarn.

8 pieces back yarn times 2 equals 16 x7,000 equals 112,000 divided by .18 equals 62,444 divided by 36 equals 17,345.5 divided by 840 equals 20.64 or 2-40s back warp yarn.

17 pieces filling yarn times 2 equals 34x7,000 equals 238,000 divided by .7 equals 340,000 divided by 36 equals 9,444 divided by 840 equals 11.24 or 1-12s filling yarn.

3 pieces fancy color (spot) yarn times 3 equals 9x7,000 equals 63,000 divided by .1 equals 630,000 divided by 36 equals 17,500 divided by 840 equals



Reed Plan. Drawing-in Draft.

20.8 or 2-40s extra warp (for figuring) yarn.

30 inches in reed, 30 dents per inch in reed, 900 minus 10 splits equals 890

splits, 40 ends 2-40s cotton selvedge, 76 ends in repeat of pattern equals 23 repeats plus 32 ends.

1,780 ends 2-20s mercerized face ends, 890 ends 2-40s cotton back ends, 40 ends 2-40s cotton selvedge ends, 94 ends 2-40s cotton colored ends, equals 900 splits or 30 inches in reed.

3 1-3 per cent contraction in width in weaving, 5 per cent take-up, 6 2-3 per cent shrinkage in length in finishing.

1,780 ends plus 5 per cent take-up equals 1,873.7 yards, 2.20s mercerized equals 3.568 ounces, 890 ends plus 5 per cent take-up equals 936.8 yards 2-40s cotton equals .892 ounces, 94 ends equals 94 yards 2-40s cotton equals .009 ounces, 40 ends plus 5 per cent take-up equals 421 yards 2-40s cotton equals .04 ounces, 56 ends 1-12s filling times 30 inches equals 1,680 yards 1-12s cotton equals 2.666 ounces; total, 7.175 ounces finished.

Carding and Spinning Particulars.

The counts of yarn required to manufacture the fabric under description would be made in the third or possibly in the second division of mills, as given in a previous lesson. It will be understood that a great many grades of fancy vestings are made and that the range of the counts of the yarns is also varied. For this article we will consider that the warp yarn count is 2-60s and that the filling yarn is 16s count. The grade of cotton used for the finer count should be good and the length of the staple about 1½ inches, although cotton from 1⅜ to 1⅝ inches may be used. For the coarser yarn a cotton with the staple of 1 inch may be used. The two different cottons would be

TREATED ALIKE

up to a certain point and unless otherwise noted what is said may be applied to both cottons. The cotton raw stock should be first brought to the bale breaker and there stapled and graded by the overseer and all bales not up to the proper standard laid aside. Several bales should be opened and placed around the bale breaker and fed to this machine alternately; that is, first a section from one bale and then a section from another, until all the cotton is fed, and not one bale fed until it is all gone. By the first method a more even mixing is obtained. Two processes of picking and an opener are generally used, and after allowing the cotton to stand in the bins as long as possible, where the good sliver waste from the cards, sliver lap and ribbon lap machines, combs, drawing frames and slubber is

MIXED WITH THE RAW STOCK,

the cotton is fed to the hopper of the opener. This machine is really the first machine that evens the cotton so that a certain weight of cotton will be delivered for a certain length. In order to accomplish this the hopper should be kept as nearly full as possible so that the lifting apron will always be loaded. The speed of the beater of this machine is about 1,050 revolutions per minute, having a fan speed of 350 revolutions per minute. The cotton is delivered from this machine to the feed rolls of the breaker picker. The speed of a rigid two-bladed type of beater should be about 1,500 revolutions per minute, the fan speed being 1,400 revolutions per minute. The

WEIGHT OF THE LAP

delivered at the front should be about 40 pounds or a 16-ounce lap for the finer counts and 20 ounces for the coarser counts. The laps are then put up at the finisher picker and doubled four into one. It is at this point that the cut roving waste is mixed in, this waste having gone through a special process to take out the twist. Mix one lap of cut waste to three of raw stock laps. The speed of the beater for this class of goods should not exceed 1,450 revolutions per minute with a fan speed of about 1,100 revolutions per minute. This class of goods should not receive more than 42 beats per inch, and for the longer staple cotton the beats per inch should be dropped to 32 to 36. If the cotton receives too many beats it is apt to put neps in and if not beaten enough, the dirt will not be taken out. The

STANDARD WEIGHT

of the finer yarn lap should be about 35 pounds, or about 12 ounces per yard. The coarser yarn lap should weigh 39 pounds, or about 14 ounces per yard. The variation from the standard weight of laps should not be more than one-half pound either way and laps which vary more than this should be run over. The laps are put up at the card and the draft for the finer count should not be less than 100 and the coarser one not over 100. Close settings should be used for the 60s yarn and some overseers speed up the top flats so that a greater amount of waste will be taken out. The same wire

may be used for both counts, i. e., 34s (American number) for cylinder and 35 or 36s for top flats and doffer. Use as large a doffer as possible. In the longer staples some overseers slow down the

SPEED OF THE LICKER-IN.

They say that the speed of this part is too fast for long staples and it tends to put neps into the cotton. The weight of the sliver for the 60s yarn should be about 50 grains, and for the 16s about 65 grains per yard. The production for the finer yarn is 500 pounds per week of 60 hours, and for the coarser yarn 65 grains per yard. Strip cards three times a day, although some overseers strip the doffer four times. The sliver for the finer yarn is combed and the coarser yarn goes direct to the drawing frame. We will first follow the

COURSE OF THE COTTON

for the 60s yarn. It is first put through the sliver lap machine, the doublings being 14 into 1, the weight of the lap being 300 grains per yard. Six of these laps are put up at the ribbon lap machine, the weight of lap at front being 260 grains per yard. The laps are then put up at the comber, the doublings being generally six into one, although eight into one is sometimes used. The speed of the comber should be about 90 nips per minute, draft 29, percentage of waste taken out 18, and the weight of the sliver about 45 grains per yard. This sliver is then put through two processes of drawing, the doublings being 6 into 1. The weight of the sliver at the finisher drawing frames is 70 grains per yard. See that your drawing frames are well oiled, the top rolls being oiled twice a day, but also see that no oil gets on the leather. See that all weights are properly adjusted and the trumpet holes the right size, also that the stop motions are all adjusted properly. The sliver is then passed to the slubber, where it is drawn into .50 hank roving. It then passes through

THREE PROCESSES OF FLY FRAME,

the hank roving at the first intermediate being 1.50, and the second 4.00 hank, and at the jack frame 13 hank. The sliver for 16s is put through three processes of drawing, the weight of sliver at the finisher drawing being 70 grains per yard, the hank roving at the slubber .50. This roving is only put through two processes of fly frames, the hank roving being made at the first about 1.50, at the second 4.00 hank. The doublings in all cases are 2 into 1. The roving is passed to the

RING SPINNING ROOM,

when it is made into 60s count. The following particulars would be used for a frame spinning this count: Gauge of spindles, 2¾ inches; diameter of ring, 1 5-16 inches; length of traverse, 5 inches; revolutions per minute of spindles, 10,000; twist per inch, 34.68. For filling, either mule or ring frames may be used. If ring frames are used, use the follow particulars: Gauge of spindle, 2¾ inches; diameter of ring, 1½ inches; length of traverse, 6½ inches. The warp yarn is then twisted into 2-ply 60s at the twister, then spooled and then put into the warper, where it is warped on beams, and from here is passed to the slasher.

Dyeing Particulars for Mercerized Vesting.

Following are the dyeing particulars for mercerized vesting:

Dyed mercerized yarn for spots.

RED.

Turkey red, or primuline red, primuline red dyeing.

6 per cent primuline red, 30 per cent Glauber's; diazotized 1½ pounds nitrate soda, 5 pounds sulphuric acid developed,two pounds Beta naphthol,well rinsed and soaped twice and rinsed in hot water.

SKY BLUE.

5 per cent immedial sky blue, 5 per cent sodium sulphide, 3 per cent soda ash, 30 per cent Glauber's, rinse well, and give a soap bath, rinse well and dry.

NAVY BLUE.

8 per cent immedial dark blue B, 8 per cent sulphide soda, 3 per cent soda ash, 30 per cent Glauber's, rinse well, soap, and rinse in hot water, and dry.

BROWN.

10 per cent thion brown G, 10 per cent sulphide sodium, 3 per cent soda ash, 30 per cent Glauber's, rinse and soap as above blue.

DARK GREEN.

10 per cent katigen dark green 2B, 2 per cent katigen blue Black B, 2 per cent katigen yellow GG, 14 per cent sodium sulphide, 30 per cent Glau-

ber's, 3 per cent soda ash, rinse and soap as above.

OLIVE.

8 per cent pyrogene olive G, 8 per cent sodium sulphide, 3 per cent soda ash, 30 per cent Glauber's, rinse and soap as above.

MAROON.

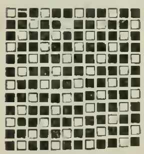
10 per cent immedial Bordeaux G, 10 per cent sodium sulphide, 28 per cent Glauber's, 3 per cent soda ash, rinse and soap as above.

BLACK.

15 per cent immedial black NN, 15 per cent sodium sulphide, 30 per cent Glauber's, 3 per cent soda ash, rinse and soap as above.

JEAN.

Jean is a narrow, hard-faced cotton fabric, weighing from 4 to 4½ ounces per yard, and is usually made of a hard-twisted warp yarn, about 1-20s cotton, and either a wool or a wool



Weave

Drawing-in Draft

Reed Plan

shoddy filling. The fabric is made with a small, uneven-sided twill weave, warp effect face, viz.: $\frac{\quad}{1}$ 45° twill, the cloth being of a slate black color.

Jean is used principally in the manufacture of ready-to-wear trousers, retailing at 85 cents to $1 per pair, for workmen who perform hard, rough and dirty work, and who do not wear overalls. For this purpose it is the most serviceable fabric on the market, the garment when worn being popularly known as Kentucky jean, which has this distinct advantage, that upon its becoming soiled, a good washing will readily cleanse and remove all dirty marks, and apparently toughen the cloth, although causing it to shrink somewhat.

"KENTUCKY JEANS"

are worn by laborers, railroaders, moulders, machinists, loom fixers, general male mill help, etc., and with a small amount of care will wear well for two or three years.

Jean is made with one warp and one filling, and can be woven in any single box, roller loom, good results being obtained from the Fairmount or Bridesburg.

The warp yarn is generally of a cheap grade of cotton, and receives about two extra turns of twist per inch, in excess of the required amount of twist in the regular yarn of a similar count. It is this fact which causes jean as a fabric to have such a hard feel.

The filling is usually a mixture, containing about 40 per cent cotton and 60 per cent wool shoddy, the yarn being spun on the woolen principle.

The wool shoddy is made by pickering and carding dark colored woolen rags, after which the cotton and shoddy are made into a mixing of relative proportions and the lot run through the mixing picker. The stock is then carded and spun, the yarn receiving sufficient filling twist, the result being a dark colored, lofty thread, a suitable filling for this fabric jean.

The warp is dyed a rather grayish black, with cheap dry color, and the warp and filling colors combined in the weaving produce a fabric of a decidedly slate black appearance.

Jean receives a dry finish, being brushed, sheared and pressed, after which it is rolled or lapped, then packed into cases, for shipment.

CONSTRUCTION.

Reed 800—30½ inches plus 2 ends per dent. 10 per cent take-up in weaving, 36 picks 1-20s cut wool shoddy, 1-20s cotton warp.

Finish equals 27 inches.

44.4x30½ equals 1,354 ends plus 10 per cent equals 1,480 yards 1-20s cotton warp equals 1.41 ounces. Warp. 36 picks times 30½ equals 1,098 yards, 1-20s cut wool shoddy equals 2.92 ounces filling.

1.41 ounces warp, 2.92 ounces filling, equals 4.33 ounces.

4.33 ounces weight, 27 inches wide.

Carding and Spinning Particulars.

The yarn used for this class of goods is constructed by two entirely different systems. The filling is generally composed of a mixture of wool or wool shoddy and cotton. The filling yarn is therefore made in a woolen mill. It is understood that entirely different machines are used, and the method of mixing is entirely different from that used in a cotton mill, although the

names of the machines in many instances are alike. The warp yarn is made of all cotton stock and is therefore spun into yarn in a cotton mill, and below will be found the carding and spinning particulars for making this count of yarn of jean fabric. Of course, these may and are deviated from in many mills, but not to any great extent.

THE RAW STOCK

generally used is of a low grade and about one inch in staple. This class of yarn is spun in mills of the first division as given in a previous lesson and the mixing would be done by hand. The bales of cotton would be sampled and all those of the same length would be put into the mixing bin. For this class of goods a small percentage of comber waste is sometimes mixed with the raw stock and some mills use the card waste. The percentage is generally small, however. The good waste from the pickers, cards and drawing frames is always used and mixed at this point. The raw stock is run through an opener and two processes of picking.

The hopper should always be kept full. The speed of the beater should be 1,050 revolutions per minute, and the fan 350 revolutions per minute. The speed of the breaker picker beater is about 1,500 revolutions per minute, the fan speed being 1,400 revolutions per minute.

THE WEIGHT OF LAP

at the front of this machine is about 40 pounds or 16 ounces to the yard. The doubling at the finisher picker is four into one and the speed of the beater (two-bladed rigid type) 1,450 revolutions per minute, which gives the cotton passing through it about 42 beats per inch. The speed of the fan is about 1,100 revolutions per minute. The weight of the total lap is about 39 pounds, or 14½ ounces to the yard. Clean out from under the pickers frequently so that the fly will not collect and be drawn back into the good clean cotton passing through.

The draft of this picker should be about 2.75. The laps are then put up at

THE CARD.

This machine should not have a draft of more than 100. The doffer should be as large as possible and the wire fillet used should be No. 33 wire (American count) for cylinder and No. 34 for doffer and flats. The flats make one revolution about every 45 minutes. The cards should be stripped three times a day and ground once a month. The weight of the sliver should be 65 grains to the yard, and the production for a week of 60 hours should be between 950 and 1,000 pounds. This sliver is then run through

TWO PROCESSES OF DRAWING FRAMES.

The settings used at one mill for this stock and staple are as follows: Front roll to second, 1¼, second to third, 1¼, and third to back, 1½ inches. The doublings at this machine are six into one and the speed of the front roller 400 revolutions per minute. The draft at the finisher machine is about 5.75. The weight of the sliver should be about 75 grains per yard. The drawing sliver should be sized at least twice a day and four times would be much better.

The sliver is then drawn into .50 hank roving by the slubber and three processes of fly frames, the hank roving being as follows: 1.50 at the first intermediate, 3.50 at the second, and 8.00 at the jack frame. The usual care should be given to the rolls, etc., and

THE ROVING

at the jack frame should be sized once a day. The roving is then put through a warp spinning frame, the particulars being as follows: Gauge of frame, 2¾ inches; diameter of rings, two inches, length of traverse, seven inches. This yarn is hard twisted and receives about two complete turns more per inch than usually used for cloth yarn; that is, the regular twist per inch for this count is 21.24 turns per inch, but for this cloth is 23.24. The speed of the spindle is about 9,400 revolutions per minute. This yarn is taken to the spoolers and spooled from the spools, is warped and put through the slasher. A good sizing is made as follows: Water, 100 gallons; potato starch, 70 pounds; tallow, four pounds; turpentine, one pint.

Dyeing Particulars.

DARK SLATE.

2½ pounds thion black G, 2½ pounds sulphide sodium, one pound soda ash, 20 pounds salt.

BLACK.

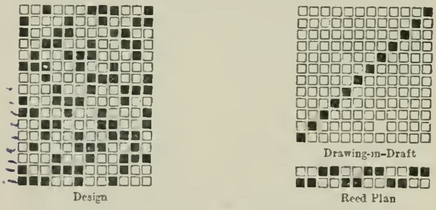
15 pounds thion black G, 15 pounds sulphide sodium, three pounds soda ash, 30 pounds salt.

CRETONNE.

Cretonne is a light-weight single cloth, all cotton fabric, weighing from 2 to 5 ounces per yard, and composed of yarns ranging from 1-40s to 1-20s in the warp and 1-20s to 1-7s in the filling.

It is usually woven with either the plain weave $\frac{1}{1}$, $\frac{2}{2}$, twill 45 degree, or a fancy effect resembling a granite weave, such as is used as a foundation weave in dress goods. The fabric is woven with either an all bleached or gray cotton warp and filling, the patterns being fancy stripes and all over floral effects printed in bright colors upon one side of the goods.

This gives the printed or face side of the fabric somewhat of the appearance of an elaborately figured jacquard design. Those colors found most effective for this purpose are bright



Harness chain same as design.

and medium shades of red, blue, green, yellow. etc., and a good jet black.

Cretonne is made in widths from 25 inches to 36 inches, the narrow grades being the lightest in weight.

The various grades are used for couch covers, draperies, lambrequins, and comfortables or bed quilts.

THE WEAVING.

Being a one-shuttle fabric, plain weave or twilled, cretonne can be woven on the single box roller loom such as the Mason, Draper, Lowell, Colvin, Lewiston, or Kilburn and Lincoln. The fancy grades in which mixed weaves are desired, necessitate the use of the Knowles Fairmount, or similar looms, with a dobby or head motion attached. The warp for cretonne, being either gray or bleached yarn, is prepared in a manner similar to that of weaving a plain ordinary sheeting.

Those grades in which the plain weave or $\frac{2}{2}$ twill weave are used are drawn in and woven upon four harnesses. If, however, a fancy weave is desired, the warp must be drawn in and woven upon a number of harnesses, in accordance with the number of ends in one repeat of weave desired.

As printing the colored pattern upon this fabric constitutes the finish thereof, the goods are taken from the loom and run through the brushing machine, to remove all dust, dirt or loose ends.

THE FIGURED PATTERN

to be produced upon the cloth has been engraved upon bronze rollers, which have been set up in the printing machine. The colors are fed automatically to the rollers, which, in revolving, register the colors upon the face of the cloth, as it passes between them. The cloth is then dried by being run through heated rollers or drums, and the fabric is then ready to be folded into suitable lengths to be packed and shipped.

Four square inches equals 7.95 grains.

29x36 equals 1,044x7.95 equals 8,299.-80 divided by 4 equals 2,074.95 divided by 437.5 equals 4.742 ounces per yard, 29 inches wide.

20 pieces white warp yarn equals x2½ inches equals 50 inches equals .55 grains, 50x7,000 equals 350,000 divided by .55 equals 636,363 divided by 36 equals 17,399 divided by 840 equals 1-20s cotton warp yarn.

12 pieces white filling yarn times 4 inches equals 48 inches equals 1.55 grains.

48x7,000 equals 336,000 divided by 1.55 equals 216,774 divided by 36 equals 6,021.5 divided by 840 equals 1-7s cotton filling yarn.

15 cents per yard, 29 inches finished.

CONSTRUCTION.

Reed, 900 minus 30 1-3 inches minus 2 ends per dent, 52 ends per inch finished,40 picks per inch finished, equals 50 ends in reed, 38 picks in loom, 10 per cent take-up in weaving.

52x29 equals 1,508 plus 10 per cent equals 1,675 yards 1-20s cotton warp yarn, 40x29 equals 1,160 yards 1-7s cotton filling yarn, 1,675 yards, 1-20s cotton warp equals 1,595 ounces, 1,160 yards 1-7s cotton filling equals 3.156 ounces equals 4,751 ounces.

10 cents per yard, 25¼ inches quality $\frac{2}{2}$ twill, four square inches equals 3.9 grains.

25¼x36 equals 909x3.9 equals 3545.1 divided by 4 equals 886.2 divided by 437.5 equals 2.025 ounces per yard, 25¼ inches wide.

Carding and Spinning Particulars.

The division of mills making cretonnes would be the second (or those mills equipped with machinery for making yarns the counts of which vary from 20 to 80s). The counts of yarn used for cretonne vary from 1-20s to 1-40s warp and from 1-7s to 1-20s filling, according to the quality of cretonne required. In speaking of the second division of mills we do not mean to say that the count of yarn is always within these limits, but that when buying machinery, the specifications for the different machines are made out according to whether the machines are to use low, medium or a fine grade of raw stock. Of course, it often happens that yarns of a lower count or of a higher count are made on this machinery, but the great bulk of the yarns turned off are within the limits. For example, take cretonne: All grades of cretonne may be made in the same mill, although the count of the yarn varies from 7s to 40s,or in some cases even a finer yarn than this is used. For this article we will consider that the filling yarn is 1-20s and the warp yarn is 1-40s. The length of staple used would be from 1 1-16 to 1¼ inches of a medium grade of cotton. The bales of raw stock would first be sampled and several bales of practically the same length of staple placed around the bale breaker and fed to this machine in small portions alternately from each bale. In this manner it is mixed better than if one entire bale was fed.

If a bale breaker is not used the method would be just the same except that it would be done by hand. The lower count would use cotton of a length of 1 1-16 inches and the higher count 1¼ inches. Both cottons would be put through an opener and two processes of picking. Keep your hopper of the opener well filled (over half full). The speed of the beater for both grades of cotton should be about 1,050 revolutions per minute; the speed of the fan about 350 revolutions per minute. See that your pin roller is always clean, because if the cotton is allowed to accumulate, it cannot perform its duty properly. The cotton is fed to the feed rolls of the breaker beater and passed on to the beater, the speed of which should be about 1,050 revolutions per minute; a rigid two-bladed type. The total weight of the lap at the front should be about 40 pounds, or 16 ounces to the yard for both cottons. The laps are doubled at the finisher picker four into one, the cut roving being mixed in at this point in the proportion of three laps of raw stock to one of bobbin waste. The speed of the beater should be about 1,450 revolutions per minute with a fan speed of 1,100 revolutions per minute. This gives the cotton passing through about 42 beats per inch. See that the grid bars under the beaters are properly set. The total weight of the lap at the front should be 39 pounds for the shorter staple cotton and 35 pounds for the longer, or a 14-ounce lap for the 1 1-16-inch staple and 12½-ounce lap for the 1¼-inch staple cotton.

Keep the picker room clean and always calculate to have enough laps of each kind of cotton ahead so that if breakdowns occur the cards will not be stopped for want of laps. The draft of the finisher picker is about 3. The cards should be set as before described in a previous lesson, except that the feed plate should be set to the licker-in, according to the length of the staple. Cards should be stripped three times a day and ground at least once a month. The wire fillet should be made of 34 wire (or 110s English count) for cylinder and 35 (or 120s English count) for doffer and flats. Use as large a doffer as possible, say 26 inches at least. The draft of the card should be about 100 for both stocks. The weight of the sliver at the front of the card should be about 65 grains. The production should be 825 pounds for the shorter staple and 600 pounds for the longer one for a week of 60 hours. The card sliver is next put through three processes of drawing frames. A few of the more particular points to look out for are, scour the frames at least once a month, keep your leather top rolls in perfect condition and well oiled and barnished. See that all knock-off motions are in working order to prevent single and double; keep the weight of your sliver uniform by sizing it at least twice a day and three times a day for fine yarns, doubling six into one at all frames. The weight of the sliver at the finisher drawing should be about 70 grains per yard. The drawing sliver is drawn into .50 hank roving at the slubber, the standard twist being found by multiplying the square root of hank by 1. The roving for the 20s yarn goes through two processes of fly frames,the hank at the first intermediate being 2 and at the second 5 hank. The 40s yarn roving is put through three processes, the hank roving at each process being as follows: first, 1.50; second, 3.50 and

third, 9 to 9.50 hank, the doublings at all frames being two into one. The sliver is then passed to the spinning room. In case the filling yarn is spun on a ring frame the following would be good particulars for the frame spinning 20s: Gauge of frame, 2¾ inches; diameter of ring, 1½ inches; length of traverse, 6½ inches; speed of spindle, 7,300 revolutions per minute; twist per inch, 14.50; and for a warp frame spinning 40s: gauge of frame, 2¾ inches; diameter of ring, 1⅝ inches; length of traverse, 6½ inches; twist, 28.45. The warp yarn is then spooled, warped and run through a slasher.

Dyeing Particulars.

RED.

5 per cent benzo fast red, 4 B S, 30 per cent Glauber's, 3 per cent soda.

YELLOW.

2 per cent chrysophenine, 30 per cent Glauber's, 2 per cent sal soda.

LIGHT BLUE.

1 per cent diamine sky blue F F, 30 per cent Glauber's, 1 per cent sal soda.

LIGHT GREEN.

1 per cent diamine fast yellow FF, 1 per cent diamine sky blue PF, 30 per cent Glauber's, 1 per cent sal soda.

ORANGE.

2 per cent tetrazo orange, C R, 30 per cent Glauber's, 1 per cent sal soda.

MAROON.

3 per cent tetrazo Corinth G, 30 per cent Glauber's, 2 per cent sal soda.

HELIOTROPE.

3 per cent heliotrope B B, 30 per cent Glauber's, 2 per cent sal soda. On a tannin and tartar emetic mordant dye the four following shades:

MALACHITE GREEN.

2 per cent malachite green; also for

MEDIUM BLUE.

2 per cent methylene blue.

PINK.

1 per cent rhodamine 5G.

PURPLE.

1 per cent methyl violet 3 B.

BLACK.

15 per cent thion black G, 15 per cent sulphide sodium, 5 per cent soda ash, 30 per cent salt.

SLATE.

2 per cent thion black G, 2 per cent sulphide sodium, 2 per cent soda ash, 30 per cent salt.

LIGHT BROWN.

8 per cent thion brown G, 8 per cent sulphide sodium, 3 per cent soda ash, 30 per cent salt.

DARK BROWN.

12 per cent thion brown G, ½ per cent thion black G, 12 per cent sodium sulphide, 3 per cent soda ash, 30 per cent salt.

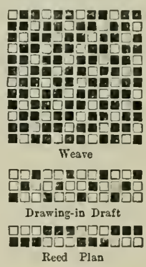
Cretonnes are also printed with very large picture designs of very bright colors, of very strong contrast generally. Some styles are of a simple character with small flowers and twigs on a white or cream-colored ground.

Other styles are of startling reds and other bright colors, on a dark brown, maroon or black ground, or on any dark colored ground to make a contrast.

The colors are printed with fast alizarine or tannin colors, which will be fast to sunlight and washing. Brightness of shade is required in most cases.

SILESIA.

Silesia is a light-weight single cloth fabric, having a rather high texture, and weighing about three ounces per yard. It is composed of all cotton



yarns 1-30s to 1-40s in warp and filling and is usually made with a $\frac{2}{1}$ 45 degree right-hand twill weave. It is used principally as a lining for ladies' and men's clothing. A

VERY IMPORTANT FEATURE

in connection with this fabric is the highly glazed or polished face of the goods, which is due to the action of the heated roller in the calendering machine upon the sizing, which the goods have absorbed in the process of finishing, just previous to the calendering operation.

Silesia is woven of yarn in the gray state and is dyed in the piece, in such colors as black, dark blue, brown,

slate, drab, steel, etc. It is woven on any single box roller loom, such as the Mason, Lowell, Lewiston, Colvin, etc.

The warp is made upon an Entwistle or Draper warping mill, and beamed upon the Lowell slasher. It is then ready to be drawn in on cotton harness, and woven in a manner similar to a drill.

TO FINISH THIS FABRIC.

The goods are taken from the loom and brushed, then run through a solution of soap and cold water to remove all dirt, after which they are rinsed in cold water.

The goods are now dyed in the piece, after which they are sized, then tentered to keep from shrinking in width, also to dry the cloth. After tentering, the goods are run through the calender to produce the smooth, glazed finish upon the face of the cloth. The finished fabric is then ready to prepare for packing and shipping.

Four square inches equals 5.4 grains.

27x36 equals 972x5.4 equals 5,248.8 divided by 4 equals 1,312.2 divided by 437.5 equals three ounces per yard, 27 inches wide finished.

24 pieces warp yarn times 1½ inches equals 36 inches equals .3 grains; 36x 7,000 equals 252,000 divided by .3 equals 840,000 divided by 36 equals 23,333 divided by 840 equals 1-28s warp.

30 pieces filling yarn times 1½ inches equals 45 inches equals .33 grains; 45x7,000 equals 315,000 divided by .33 equals 924,242 divided by 36 equals 25,673 divided by 840 equals 1-30s filling.

CONSTRUCTION.

Reed, 1,012 minus 28.7 inches in reed minus three ends per dent, 90 ends per inch finished and 72 picks per inch finished, equals 86 ends in reed and 69 picks in loom.

10 per cent take-up on warp in weaving 6 per cent size on warp in weaving.

1-28s cotton warp,1-30s cotton filling.

Color—slate or drab.

90x27 equals 2,430 plus 10 per cent equals 2,700 yards 1-28s cotton warp, 72x27 equals 1,944 yards 1-30s cotton filling.

2,700 yards 1-28s cotton warp equals 1.837 ounces, 1,944 yards 1-30s cotton filling equals 1.234 ounces, equals 3.071 ounces.

Finish equals brush and calender.

Carding and Spinning Particulars.

The yarns used in making silesia vary from 30s to 40s. These counts of yarn would be made in a mill of the second division as given in a previous lesson. Mills making this class of goods are now generally equipped with a bale breaker. After the cotton is stapled and the bales sorted out, according to the length of staple and grade of cotton, several bales are placed around the bale breaker and the cotton fed to this machine alternately from each bale. By this method the

COTTON IS MORE THOROUGHLY MIXED

than if a whole bale was fed to the machine at once. The cotton is then dropped on an endless lattice and carried to its proper bin. This latter is generally movable in either direction so that it may be placed in position to drop the cotton into its proper bin. The mixings should be as large as possible and cotton of a fair grade having a staple of 1⅛ to 1¼ inches for this class of goods. The mixings should be allowed to stand as long as possible and the good waste from the pickers, cards, drawing frames and back of slubber should be mixed in at this place. The waste from the above machines is collected at regular intervals, and may be mixed as fast as collected. Little system is used in mixing the waste into the raw stock, but the picker room boss should watch to see that the waste man keeps the different lengths of staples, kinds and grades of cotton by themselves. Otherwise trouble is bound to occur at the latter machines. The raw stock is put through an opener, and sometimes three but more often

TWO PROCESSES OF PICKING.

The hopper of the opener is filled with cotton and started up and should be kept well filled all the time it is in motion. The speed of the beater of this machine for this class of goods should be 1,050 revolutions per minute with a fan speed of 350 revolutions per minute. Keep your pin beater clean and see that it is adjusted to the proper distance from the lifting apron so that the correct amount of cotton will be fed to the breaker picker. The total weight of the laps for both the warps and filling yarn should be about 40 pounds or 16 ounces to yard of lap. These laps are put up at the finisher picker and doubled four into one. The speed of the beater is 1,450 revolutions per minute, with a fair speed of 1,100 revolutions per minute. This gives the cotton about 42 beats per inch of cotton fed. The beats per inch given

to cotton do not vary much on all classes of cotton, except in the case of Sea Island, of a long staple. In the latter case the speed of the beater is slowed down so that the cotton receives from 29 to 34 beats per inch. The total weight of the lap at the front end of the finisher is 35 pounds or 12½ ounces to yard of lap. The

BOBBIN WASTE COTTON

is mixed at this point, it first having gone through an extra process to take out the twist. This waste is made into a lap and then put up at the finisher picker and mixed in proportions of three laps of raw stock to one lap of bobbin waste. The draughts of the picker should be looked after to see that the currents of air are properly directed so as to obtain the best advantage in making an even, firm lap that will not lick up at the card. Too much waste in the mixing will also tend to make a lap split or lick up at the card.

THE CARD

should have a draft of not less than 100. The settings should be the same as given in a previous lesson and the cylinder and doffer stripped three times a day. The cylinder and doffer should be ground once a month and the flats about once in every three weeks. The weight of the sliver at the front should be about 65 grains per yard. Use the same count of wire for cylinder and doffer as given in the last article.

The card sliver is put through three processes of drawing. In some mills the cotton is put through a railway head. This machine doubles from 8 to 16 ends and this at the front passes through a trumpet, which automatically evens it. When this process is used, one process of drawing frames is left out. The weight of the sliver at the front of the finisher drawing should be about 70 grains per yard. See that your leather top rolls are well varnished and otherwise in perfect condition. The following directions will be found excellent for making the varnish to use on the rolls: three ounces glue (use a gelatin fish glue), one ounce of acid (acetic). Let this dissolve and then add color and 10 or 12 drops of oil of origanum. In warm weather a little borax may be added. The sliver is taken from the drawing frame and run through the slubber, where it is made into a .50 hank roving. The slubber roving is then put through

THREE PROCESSES OF FLY FRAMES

for both warp and filling yarns, the hank roving being as follows: First intermediate, 1.50; second intermediate, 4 and 7.50 hank at the jack frame for the warp yarn and 8. for the filling yarn. See that your fly frame rolls are spread to the proper distance and look out for the shape of your full bobbins to see that the taper of the ends is neither too blunt nor too sharp. If the former, it is liable to run over both on the frame and in handling,and if the latter,only a small amount of roving can be wound on each bobbin. The warp yarn is spun in the ring spinning frame, but the filling yarn may be either spun on a ring frame or a mule, but is generally done on the former machine. The particulars for a warp frame spinning 36s yarn has already been given in a previous lesson. Those used for a filling frame spinning 40s are as follows: Gauge of spindles, 2¾ inches; diameter of ring, 1 5-16 inches; length of traverse, 5½ inches; speed of spindle, 8,800 revolutions per minute; twist per inch, 23.72. The warp yarn is then spooled, warped and put through a slasher.

Dyeing Particulars.

Silesias are dyed on the jig machine at the full width of the piece.

CREAM.

A few grains of fast cotton yellow C Ex, 5 pounds Glauber's, one-half pound sal soda.

LIGHT ECRU.

1-16 ounce fast cotton yellow C Ex, 1-16 ounce, direct orange T G.

ECRU.

1-16 ounce fast cotton yellow C Ex, 1¼ ounces fast cotton brown G, 5 pounds Glauber's, ½ pound sal soda.

LIGHT SLATE.

2 ounces fast cotton yellow C Ex, 4 ounces direct black S. 5 pounds Glauber's, ½ pound sal soda.

SLATE.

1 pound direct black S, 4 ounces fast cotton yellow C Ex, 10 pounds Glauber's, 1 pound sal soda.

DARK SLATE.

2 pounds diamine black B H,4 ounces diamine fast yellow A, 4 ounces oxydiamine black A, 20 pounds Glauber's, 2 pounds sal soda.

LIGHT DRAB.

4 ounces diamine fast yellow A, 4 ounces diamine brown B, 4 ounces

diamine black B H, 10 pounds Glauber's, 2 pounds sal soda.

DRAB.

½ pound diamine fast yellow A, ½ pound diamine black B H, 6 ounces diamine brown B, 10 pounds Glauber's, 2 pounds sal soda.

LIGHT TAN.

½ pound diamine fast yellow A, ½ pound diamineral brown G, 10 pounds Glauber's, two pounds sal soda.

TAN.

2 pounds diamine catechine 3 G, 1 pound diamine fast yellow B, 10 pounds Glauber's, 2 pounds sal soda.

OLD GOLD.

3 pounds diamine fast yellow B, 2 pounds diamine catechine 3 G, ½ ounce diamine black B H, 10 pounds Glauber's, 2 pounds sal soda.

PEARL.

1-16 ounce diamine brilliant blue G, 5 pounds Glauber's, 1 pound sal soda, aftertreated ¼ per cent copper sulphate.

SKY BLUE.

6 ounces diamine sky blue F F, 5 pounds Glauber's, ½ pound sal soda.

BLUE.

2 pounds diamine blue R W,5 pounds Glauber's, ½ pound sal soda.

RED.

6 per cent primuline, 25 per cent Glauber's, 3 per cent sal soda.
Diazotized 1½ per cent nitrate soda 5 per cent sulphuric acid. Developed two pounds beta naphtol.

SCARLET.

4 pounds benzo fast scarlet 4 B S, 30 pounds Glauber's, 3 pounds sal soda.

MAROON.

5 pounds tetrazo corinth B, 30 pounds Glauber's, 3 pounds sal soda.

HELIOTROPE.

½ pound heliotrope B B, 10 pounds Glauber's, ½ pound sal soda.

PINK.

½ pound tetrazo pink B U, 20 pounds Glauber's, ½ pound sal soda.

YELLOW.

1½ pounds chlorine yellow G G, 20 pounds Glauber's, 2 pounds sal soda.

ORANGE.

2 pounds benzo fast orange S. 30 pounds Glauber's, 3 pounds sal soda.

DARK GREEN.

3 per cent benzo dark green G G, 2 per cent chrysophenine, 1 per cent direct black B.

GREEN.

3 per cent brilliant benzo green B, ½ per cent chrysophenine, 30 per cent Glauber's, 3 per cent sal soda.

NAVY BLUE.

5 per cent diazo black B H N, 30 per cent Glauber's, 3 per cent sal soda.

LIGHT BROWN.

6 per cent thion brown G, 6 per cent sodium sulphide, 30 per cent Glauber's, 3 per cent soda ash.

BROWN.

6 per cent diamine brown B, 1 per cent diamine yellow B, 1 per cent diamine catechine G, 30 per cent Glauber's, 3 per cent sal soda.

DARK BROWN.

2 per cent benzo fast black, 2½ per cent benzo fast red L, 4 per cent chrysophenine, 30 per cent Glauber's, 3 per cent sal soda.

BLACK.

15 per cent thion black B, 15 per cent sodium sulphide, 3 per cent soda ash, 30 per cent Glauber's.

LAWN.

Lawn is a light-weight, single cloth wash fabric, weighing from 1¼ ounces to 2¼ ounces per yard and in widths from 36 inches to 40 inches finished. It is composed of all cotton yarns (bleached) from 1-40s to about 1-100s, and is always woven with a plain weave $\frac{1}{\overline{1}}$.

PLAIN LAWN

is made of solid white or bleached yarn in both the warp and filling. The fancier grades, or those having a color effect, are produced by printing vines, floral stripes, small flowers, etc., in bright colors, in scattered effects upon the face of the goods, the warp and the filling in all cases being bleached yarns. The patterns are always printed, never woven.

Lawn is made in various grades ranging in price from 5 cents to 12½ and 15 cents per yard, and it is used principally in the manufacture of ladies' and children's summer dresses, sash curtains, etc. Being a rather sheer fabric, lawn is best adapted to

those light running looms in which the action of shedding is easiest upon the fine yarns used in this style of goods. The warp for this fabric is dressed or beamed upon a regular dressing frame. It is then drawn in on 4 harnesses to permit of freedom in shedding.

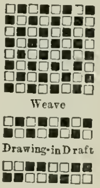
The plain weave requires but two harnesses, but where there are a great number of ends in the warp, the yarn would be very much crowded if the warp was drawn in on two harnesses. Therefore, four or more harnesses are used.

Lawn, when finished, should have a very soft, smooth feel. Therefore the finishing process includes brushing, very light starching or sizing, then calendering or pressing.

16 square inches equals 6.9 grains.

40x36 equals 1,440x6.9 equals 9,936 divided by 16 equals 621 divided by 437.5 equals 1.419 ounces per yard, 40 inches wide finished.

40 pieces white warp yarn x 3½ in-


Weave
Drawing-in Draft
Reed Plan

ches equals 140 inches equals .5 grains.

140x7,000 equals 980,000 divided by .5 equals 1,960,000 divided by 36 equals 54,444 divided by 840 equals 1-66s cotton warp.

46 pieces white filling yarn x 2½ inches equals 100 equals .35 grains.

100x7,000 equals 700,000 divided by .35 equals 2,000,000 divided by 36 equals 55,555 divided by 840 equals 1-66s cotton filling.

CONSTRUCTION.

40 inches finished.

64 ends per inch finished, 62 picks per inch finished equals 60 ends in reed and 58 picks in loom.

Reed, 1,080; 42¾ inches in reed. 2 ends per dent.

5 per cent take-up on warp in weaving.

64@40 equals 2,560 ends plus 5 per cent take-up equals 2,694 yards.

62 picks x 40 inches equals 2,480 yards.

2,694 yards, 1-66s cotton warp equals .748 ounces; 2,480 yards, 1-66s cotton filling equals .712 ounces, total, 1.460 ounces.

Carding and Spinning Particulars.

The counts of yarns from which lawn is made vary according to the quality of lawn being made. This varies from 40s to 100s. The yarns are made in the third division of mills, as given in a previous lesson or those mills which make high count yarns. In this article we will consider the warp yarn to be 60s and the filling yarn to be 100s. For these two counts raw stock of two different lengths of staple and grade of yarn would be used. For 100s a Sea Island cotton of about 1⅝-inch staple may be used and for the warp yarn an Allen cotton of about 1½ inches staple. The two cottons would be treated differently at every process and so we will describe the two cottons at each process. The Allen cotton would be put through the bale breaker, in the manner ascribed in the article of last week, and carried to its proper bin. At this point the

GOOD WASTE IS MIXED IN.

It is not the general custom to run the Sea Island cotton through the bale breaker, but to mix it by hand great care should be taken that all the bales mixed are of a uniform length and that the grade of each bale is up to standard. Those bales not up to standard should be shipped back to the broker. The good waste is mixed in at this point, but be sure that the waste boy only puts in Sea Island cotton for, if a shorter staple cotton gets in, it will cause trouble at subsequent machines. The Allen cotton is put through two processes of picking and an opener. For this class of cotton three processes of picking would be better, for, as it is a very dirty cotton, the extra picking would help to clean it. The speeds of all the picking machines previously given may be used for this cotton. The weight of the lap at the breaker picker should be about 40 pounds or a 16-ounce lap. The doublings are four into one at the finisher, the total weight being 3.5 pounds or a 12-ounce lap. If an intermediate picker is used, the total weight of the lap should be about 37 pounds or a 12-ounce lap. The

SEA ISLAND COTTON

is only put through an opener and one process of picking, the reason for this being that the staple is so long that if two processes are used the extra beating that it receives tends to put neps into the staple. The speeds of the opener are slowed down and the speeds of the finisher parts are as fol-

lows: The speed of a rigid two-bladed beater should not exceed 1,000 revolutions per minute. The total weight of the lap should be about 30 pounds or about a 9-ounce lap to the yard. The roving waste should be mixed in at the finisher picker process, as previously explained. The cards should be set close for both cottons, the main difference being in the setting of the feed roller to the licker-in, which should be set according to the length of staple. The usual points that have been given in previous lessons should be looked out for when running Allen cotton, the weight of the sliver in front being 65 grains to the yard and the production being about 500 pounds for a week of 60 hours, the draft being not less than 100. For Sea Island

ADDITIONAL CARE

has to be taken; also certain speeds have to be altered. It has been found that by slowing the speed of the licker-in less neps are put into the cotton and still the cotton is cleaned. In fact, one overseer using this class of cotton lagged his licker-in pulley so as to obtain an extra diameter of 1½ inches and found the results excellent, the sliver showing fewer neps than when the usual speed of the licker-in was used. On this cotton it is the general practice to use high drafts and sometimes a draft of 165 is used, but for general purposes a draft of about 130 is used. The flats are speeded so as to make one complete revolution every 45 minutes, the extra speed being obtained by lagging the pulley on the cylinder that drives the flats. This, of course, takes out more waste, but it makes less work for the combers to do. The weight of the sliver at the card is about 45 grains per yard. Strip and grind cards the same as stated in previous articles.

THE WIRE FILLET.

used for cards making sliver for high class yarns is generally firmer than that previously given, and if cards are used for high count yarn the size of the fillet should be as follows: Cylinder No. 34 wire or 110s English count; doffer and top flats, No. 36 wire or 130s English count. The production of a card on Sea Island cotton varies from 325 to 450 pounds per week of 60 hours. Four hundred pounds is a good average. From the cards both cottons are taken to the comber room and the doublings at the sliver lap are 14 into one. The weight of the Allen lap at the front is 320 grains per yard and the Sea Island weighs 250 grains per yard. The cottons are then put through the ribbon lap machine, where the Allen is doubled 6 into one, but it is the general custom to double the Sea Island only 5 into one, the weight of lap at the front end being 260 grains per yard for Allen and 200 grains for Sea Island. The laps are taken to the combers, where they are doubled 6 into one. The speed of the combers should be about 85 to 90 neps per minute for Allen and 75 to 80 for Sea Island. The amount of waste taken out at the comber is important. a good average for Allen is 18 per cent and for Sea Island 20 to 25 per cent. The

WEIGHT OF THE SLIVER

for Allen is about 42 and for Sea Island about 36 grains per yard. After passing through the comber the sliver is put through two processes of drawing, the weight of the sliver at the front being 60 grains per yard for Sea Island and 70 grains for Allen. On all machines when leather top rolls are used for Sea Island, stock should be kept in the best of shape and oiled and varnished frequently. The speed of the front roll on the finisher drawing for Sea Island should be about 320 revolutions per minute or 80 revolutions per minute slower than for Allen. The slubber draws the sliver into .50 hank roving for Allen and .80 hank for Sea Island. The Sea Island is put through three processes of fly frames, the hank roving being as follows: First intermediate, 2.25; second intermediate, 5.00; jack frame, 18 hank; and for Allen: First intermediate, 1.50; second intermediate, 4.00; jack frame, 12 hank. The twist per inch put into Sea Island cotton is a little less than the usual amount used for other cottons, the standard for jack frames being square root of hank x 1.2. The filling yarn is mule spun and the warp yarn ring spun, the following particulars being used: Gauge of frame, 2¾ inches; diameter of ring, 1½ inches; length of traverse, 6 inches; speed of spindle, 10,000 revolutions per minute; twist per inch, 34.86. The warp yarn is then taken to the spoolers and from here to the warpers, where it is run on beams and taken to the slasher. The following is a good size to use: 100 gal. water, 54 pounds potato starch, 2 pounds Yorkshire gum, 1½ pounds soap.

Finishing Particulars.

Lawns have to be very carefully handled in the bleaching process.

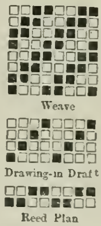
They are starched with an ordinary starch mangle with from 8 to 12 ounces best white German dextrine per gallon, mixed cold, and boiled for one hour, with a little blueing added to shade required.

They are then finished on the stenter machine, dryed with hot air, care being taken to keep the pieces perfectly straight. Some bleachers handle each piece separately from start of process to finish, bleaching, starching by hand in a tub and drying in a frame in the stenter stove. By so doing the pieces do not get drawn and the filling is always straight across the piece.

Lawns are often tinted light shades of blue, pink, cream, ecru, pearl, green and other light tints with direct colors added to the starch, the direct colors being used generally. The basic and acid colors are also tinted to make bright colors.

TARTAN PLAIDS.

Tartan plaid is a narrow, lightweight, single cloth fabric, weighing from 2 to 2¼ ounces per yard finished, and is composed of regular cotton yarns from 1-20s to 1-26s in warp and



filling. It is always woven about 23½ inches in the reed, to finish about 22 inches wide. This is done to prevent it from coming too close to the gingham lines.

Tartan plaids are generally woven with a $\frac{2}{\ }$ 45 degree, right hand twill weave, and are always woven in plaid patterns in imitation of the imported worsted fabric of this name.

Each line of patterns has a standard name, which represents a significant style of color arrangement, such as Rob Roy, dress Stewart, Royal Stewart, Malcolm, Fraser, McGregor, Sinclair, Gordon, Drummond, Macpherson, etc.

Those colors most used are red, green, black, white, brown, drab, wine, dark green, scarlet, dark blue, etc.

IN THE ROB ROY STYLE

the pattern takes the form of a broad, two-colored check, 1¼x1¼ inches, either black and red, or black and white, viz.: 72 black, 72 red in warp and filling. The dress Stewart pattern is composed principally of white yarn. The Royal Stewart has a decided red color effect. The Gordon pattern a very green color effect, etc.

Aniline colors are used in dyeing the yarns for this fabric, the warp yarns being given an extra run, to insure an even shade, which, while not being exactly a fast color, is strong enough to withstand the action of a rather wet finish (gingham finish).

The Fairmount 4x1 box roller loom is used for the 2, 3 and 4 shuttle tartan plaids and the Knowles 4x4 gingham loom for those styles having more than four colors in the filling.

The warps for this fabric are ordered from the spinner in either 720 yards, 1,080 yards, 1,200 yards or 1,500 yards lengths, and have either 1,000 ends, 1,200 ends, 1,400 ends, or 2,000 ends, in them.

The most popular are 720, or 1,080 yards and 1,400 ends.

The warp is dyed in bulk and the necessary number of ends of each color are then split off. When all the colors have been split or separated, the splittings, or separated bunches of ends of each color, are assembled in the beaming frame, and the yarn is arranged as per pattern in the rathe comb, and the warp run through this rathe on to the beam. After beaming the warp is drawn in in the regular manner.

To finish this fabric, the goods are taken from the loom and run through the brusher, then through the sprinkler, after which they are very lightly sized, then run upon the tentering machine to prevent undue shrinkage in width, also to assist in drying, then calendered, but not to a glossy finish.

CONSTRUCTION.

Style—Rob Roy—finished 22 inches wide; reed, 1,080—23½ inches in reed, two ends per dent; 1-26s cotton warp—10 per cent take-up; 1-22s cotton filling—40 picks; $\frac{2}{2}$, 45 degree, right-hand twill weave, 16 ends extra for selvedge.

Warp pattern: 72 black x 72 reed, total 144, all equal 9 patterns plus 112 ends.

1424 ends in warp (including selvedge).

Start 29 red at x, end 28 red at x.

704 ends black plus 10 per cent equals 780 yards 1-26s warp equals .5715 ounce; 720 ends red plus 10 per cent equals 800 yards 1-6s warp equals .5860 ounce; 48 picks times 23½ equals 564 yards, 1-22s filling equals .488 ounces and 564 yards, 1-22s filling equals .488 ounce, equals 2.1335 ounce. 2.1335 ounces per yard, 22 inches wide.

Finish—very light size, tenter, calender.

Carding and Spinning Particulars.

The yarns used in the manufacture of tartan plaids are made in mills of the first and second division,as given in a previous lesson. The counts of yarn vary according to the mill in which they are made and the counts taken as examples for this article are 1-22s filling yarn and 1-26s warp yarn. The cotton used for these goods is of a fair grade and a staple varying from ⅞ inch to 1 1-16 inches. We will consider the staple to be one inch. The cotton is stapled and put through a bale breaker and from here is passed by a series of lattice aprons to the mixing bin. Use as large a mixing as possible at one time, because the less mixings the evener the yarn will be. The good waste from the machines up to the slubber is mixed into the raw stock at this point, the collections of this waste being made at regular intervals. The raw stock is sometimes put through

TWO PROCESSES OF PICKING

and an opener and sometimes through three processes of picking and an opener. It has been found that two processes of picking will clean the cotton properly, and at the same time will not be so apt to put neps into it. When two processes of picking are used, the particulars of the intermediate picker given below may be dropped. the other particulars remaining the same as given. The hopper or feed box of the opener should always be kept at least half full and generally a porcupine beater is used. The speed of this beater should be about 1,050 revolutions per minute, with a fan-speed of 350 revolutions per minute. The cotton is then passed to the feed rolls of the breaker picker. Keep the pin beater of this machine free from cotton, as it has to be watched to see that the sliver waste does not tangle around it. This roll is more troublesome on some makes of machines than on others. The

SPEED OF THE BEATER

(which generally is of a two-bladed rigid type) is 1,500 revolutions per minute,the fan speed being 1,400 revolutions per minute. The weight of the lap at the front should be about 40 pounds total weight or a 16-ounce lap. Some system of marking has to be employed so that the laps of other grades and lengths of staple will not become mixed and thus cause trouble later on. Of course, like staples and weights of laps may be placed together, but it is the general custom to mark the laps at the end as they are taken off the machine with different colored crayons. For example, 1 1-16 may be marked brown, 1⅛ blue, 1 1-16 salmon, etc. This is not generally done at any except the finisher picker. The laps are doubled four into one at the intermediate picker, the speed of the beater being 1,450 revolutions per minute, and the speed of the fan 1,050 revolutions per minute. The weight of the lap at the front is about 37 pounds. These laps are put up at the finisher picker and doubled four into one. It is at this point that

THE ROVING WASTE

is mixed in in a proportion of one lap of roving waste to three laps of raw stock. The cotton receives about 42 beats per inch fed. The total weight of the lap is about 39 pounds,or about a 16-ounce per yard lap. The speed of the beater is about 1,500 revolutions per minute, and the speed of the fan 1,100 revolutions per minute. The laps are then put up at the card. The card is set to accommodate this stock as described in a previous lesson, the speed of cylinder being 160 revolutions per minute. The speed of the licker-in is 300 revolutions per minute. Flats make one complete revolution every 40 minutes. The draft should not exceed 100. Use a large diameter doffer.

Strip three times daily and grind at least once a month. The weight of the sliver is 65 grains per yard. The production is about 900 pounds per week of 60 hours. The sliver is then put through

THREE PROCESSES OF DRAWING,

being doubled six into one, the speed of the front roller being 400 revolutions per minute, the weight of drawing at the finisher being 70 grains. Some of the points that are to be looked out for are as follows:

Stop motions, rolls, laps and oiling. The sliver is next taken to the slubber and made into .40 hank roving,the usual standard for twist being used. Look out for the shape of your bobbins The slubber roving is put through three processes of fly frames, doubling two into one. The hank roving at the first intermediate is 1.10, at the second 2.70 hank and at the jack frame five hank.

The rovings are then taken to the spinning room and made into the required yarn.

THE FILLING YARN

may be taken to either the mule or ring spinning room. If taken to the ring spinning room, the following are good particulars to use for frame making 22s yarn: Gauge of frame,2¾; diameter of ring, 1½ inches; length of traverse, 6½inches; twist per inch, 15.-25; speed of spindles, 7,400 revolutions per minute. For a warp frame spinning 26s use gauge of frame, 2¾ inches; diameter of ring, 1¾ inches; length of traverse, 6 inches; speed of spindles, 9,700 revolutions per minute. The warp yarn is then spooled, warped and put through a slasher.

Dyeing Particulars.

RED.

4 per cent diamine fast red F, 30 per cent Glauber's, 3 per cent sal soda.

GREEN.

1½ per cent diamine sky blue FF, 1½ per cent diamine fast yellow FF, 30 per cent Glauber's, 3 per cent sal soda.

BLACK.

15 per cent thion black G, 15 per cent sulphide soda, 30 per cent salt; 3 per cent soda ash.

BROWN.

5 per cent benzo fast orange S, 2 per cent chrysophenine, 2½ per cent benzo fast black, 30 per cent salt, 2 per cent soda ash.

DRAB.

¾ per cent benzo fast black, ½ per cent chrysophenine, 3 ounces benzo fast red G L, 30 per cent Glauber's, 2 per cent sal soda.

SLATE.

½ per cent benzo fastblack, ¼ ounce chrysophenine, ¼ ounce benzo fast red GL, 30 per cent Glauber's, 2 per cent sal soda.

SCARLET.

5 per cent diamine scarlet B, 30 per cent Glauber's, 2 per cent sal soda.

DARK GREEN.

6 per cent diamine black HW, 4 per cent diamine fast yellow B, 30 per cent Glauber's, 2 per cent sal soda.

WINE.

6 per cent diamine Bordeau B, 30 per cent Glauber's, 3 per cent sal soda.

BLUE.

4 per cent brilliant benzo blue 6 B, 30 per cent Glauber's, 3 per cent sal soda.

DARK BLUE.

15 per cent pyrogene indigo B, 15 per cent sodium sulphide, 30 per cent salt, 3 per cent soda ash, 2 pints mineral oil.

YELLOW.

2 per cent chloramine yellow M, 30 per cent Glauber's, 2 per cent soda ash.

BAYADERE.

Bayadere is a fabric in which the pattern consists of a stripe running across the width instead of the length of the material. Such patterns are almost entirely confined to ladies' and children's dress goods, and may be composed entirely of cotton, as in the cheapest grades, of cotton and worsted in the medium, or entirely of worsted or worsted and silk in the best grades.

The fabric considered in this article is a medium grade cloth of ladies' dress goods, and is composed of worsted, silk and cotton and weighs 5½ ounces per yard, 36 inches wide, finished.

The pattern is a zigzag stripe, extending across the fabric in the direction of the weft on a rep ground.

Figure 1 shows the full design for the one repeat of the pattern, and is complete on 132 warp threads and 30 picks.

Figure 2 is the drawing-in draft and is complete on 13 harnesses.

Figure 3 is the reeding plan.

Figure 4 is the chain draft.

The arrangement of the warp and weft threads is as follows:

Warp, 2 threads blue 2-50s worsted

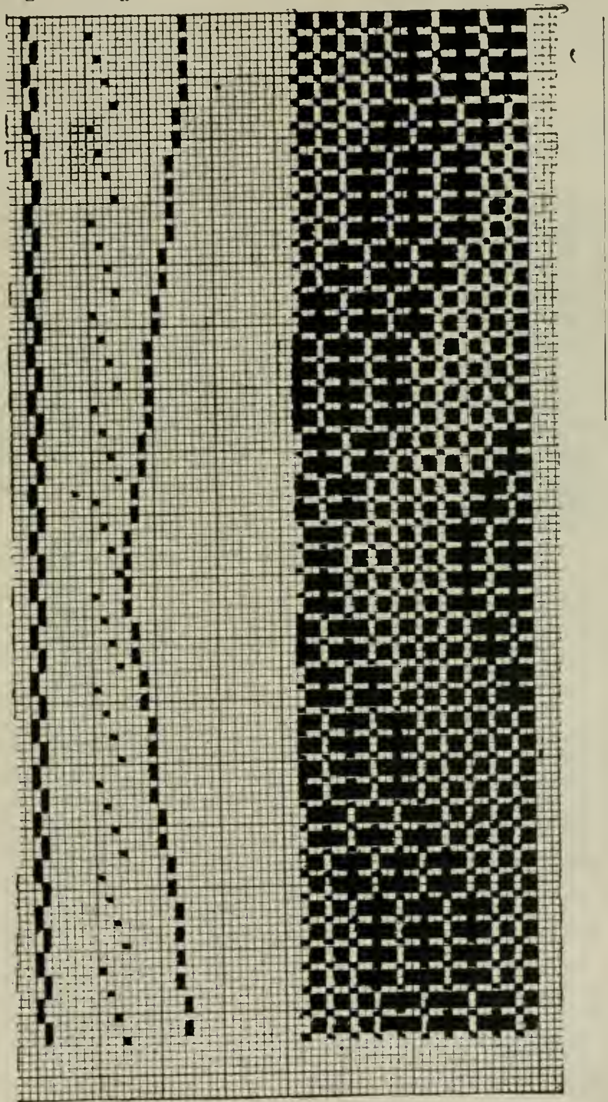
(xx Ohio), 1 thread brown 2-60s cotton (carded peeler); 3 threads in pattern.

Weft, 1 pick light blue 40-2s spun silk, 2 picks brown, 20-cut cotton (wool spun); 3 picks in pattern.

When drawing-in, cotton must always come on first four shafts, and worsted on the last nine shafts.

Almost any dobby loom might be used having the required number of harnesses and shuttle boxes.

Fig. 3. Fig. 2. Fig. 1.



20 reed, 3 threads per dent—60 threads per inch. Reeded 38½ inches wide for 36 inches finished, 40 picks per inch.

The above warp must be made on two beams: cotton threads on top beam, worsted threads on bottom beam.

In regulating the tension of the two beams, considerable care must be used in order that the rib in the ground may be made as clear and distinct as possible. This may be accomplished by having relatively more weight on the cotton beam than on the worsted, which is an important feature in the

manufacture of all fabrics of a rep character, and which is fully illustrated by the small sketch, Figure 5. It will be noticed that the cotton (thin) threads are held very nearly straight, while the worsted are forced to bend around the heavy picks of the weft. The take-up of the worsted threads is therefore much greater than that of the cotton, being about eight per cent, while the cotton is only about two per cent.

The worsted warp then must be made relatively longer.

In introducing the weft threads, the

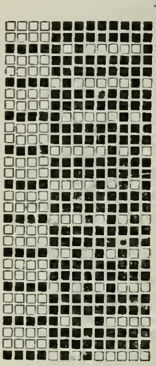


Fig. 4.

silk pick must always enter when the cotton warp threads are up in the ground portion of the cloth.

THE FINISHING.

In finishing fabrics of this character everything depends upon the quality of the cloth—the fabric just described having a dry finish, viz.: after being burled and mended, it is brushed and pressed and rolled and is then ready for shipment.

In the best grades, however, the cloth must be scoured, tentered, sheared, brushed and pressed before being rolled and made ready for shipment.

Carding and Spinning Particulars.

The machines used in making the count of yarn required for the warp yarn of bayadere will be found in the second division of mills, as given in a previous lesson. Bayaderes, as has been stated, may be composed of all worsted, or all cotton yarns or a mixture of worsted and cotton yarns, or a mixture of worsted, silk and cotton. In fact, there may be almost any combination of these three fibres. The best grades of bayadere are made up of worsted and silk yarns. For this article we will consider that the fabric is composed of all three kinds of raw stock, worsted, silk and cotton. For the warp, 2-60s yarn is used and for the filling a 20-cut cotton yarn is used. The filling yarn is spun in a woolen mill and so

THE WARP YARN

will be the one considered under the above heading.

For this count of yarn a peeler cotton is used of about 1¼ inches staple. This cotton should be of a good grade and should be run through a bale breaker. The principal part of the mixing is done at the bale breaker for this cotton. The cotton is brought from the storehouse and sampled and the bales having the same length of staple are put together. Those having a staple or grade not up to mark are laid one side. Several bales are opened and placed around the bale breaker and the attendant feeds from each bale alternately until all the cotton is gone. As many bales as possible and convenient should be opened

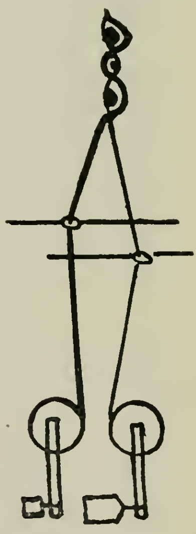


Fig. 5.

and placed around the bale breaker at one time because a

MORE EVEN MIXING

will thus be obtained and the yarn will run a great deal evener. After passing through the bale breaker the stock is conveyed automatically to the mixing

bins. If the mixing is done by hand, the same points have to be looked out for, the only difference being that several hands are used instead of a machine. At the bins the good waste is mixed. The raw stock is then passed through two or three processes of picking and an opener. If only two processes of picking are used, then the particulars given for the intermediate picker may be left out, the other particulars given remaining the same. The hopper of the opener should always be kept more than half full. The speed of

THE BEATER

is 1,050 revolutions per minute. Generally a porcupine style of beater is used for this machine, with a fair speed of 350 revolutions per minute. The cotton is then passed to the breaker picker. The speed of the beater (two-bladed rigid type) is about 1,500 revolutions per minute, that of the fan, 1,400 revolutions per minute. The weight of the laps at the front should be about 40 pounds, or a 16-ounce lap. The laps are put up at the intermediate picker and doubled four into one. The speed of the beater should be 1,450 revolutions per minute. That of the fan 1,050 revolutions per minute. The weight of the laps at the front end should be about 37 pounds, or a 12-ounce lap for peeler cotton to make this class of goods.

The laps are put up at the finisher picker and doubled four into one. It is at this point that the

CUT ROVING IS MIXED IN

(it having been previously put through a special picker, which takes out the twist and leaves it in a fluffy, untwisted state and then it is put through a picker and made into a lap of the same weight as the laps from the intermediate picker), in the proportion of three laps of raw stock to one lap waste. The speed of the beater for this machine is 1,450 revolutions per minute, with a fan speed of 1,100 revolutions per minute. This gives the cotton passing through 42 beats or blows per inch. The weight of the lap at the front is 35 pounds, or a 12½-ounce lap. Watch all the points that have previously been pointed out. The variation from standard should not be over 8 ounces either side for the total lap. The lap is next taken to the card. The

SETTINGS OF THE CARD

for this division of mills have been previously given.

The draft should not exceed 100; speed of licker-in, 300 revolutions per minute; speed of flats, 1 revolution every 45 minutes; weight of sliver, 65 grains; production about 650 pounds for week of 60 hours. Strip three times a day, grind once a month, and use as large a doffer as possible. The sliver is next put through three processes of drawing, the doublings at each process being six into one, the weight of the finisher drawing being 72 grains per yard, and the revolutions per minute of front roll 350. Either metallic or leather covered rolls may be used at this machine. If the former are used, see that they are properly set and keep them well scoured; if the latter are used, keep them in good repair, well varnished, and oiled. For this length of staple the following

SETTINGS

of the bottom steel rolls may be used: Front roll to second roll, 1½ inches; second roll to third, 1⅝ inches; third roll to back, 1¾ inches. The sliver is put through the slubber and made into .55 hank roving. Three processes of speeders or fly frames are used, the hank roving being as follows: at first intermediate 1.50; at the second, 4, and at the jack frame, 12. The usual points are to be looked out for in connection with fly frames. The roving is then passed to the spinning room and made into 60s yarn. For a warp frame making this count use the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1½ inches; length of traverse, 6 inches; twist per inch, 34.86; speed of spindle, 10,000 revolutions per minute. The yarn is then taken to the twister and doubled or twisted into a two-ply yarn. It is then passed to the spooler and from here to the warper and from here to the slasher.

Dyeing Particulars.

BROWN.

5 per cent diamine brown B, 1 per cent diamine fast yellow B, 30 per cent Glauber's, 2 per cent sal soda.

LIGHT BLUE (SILK).

1 per cent patent blue, pure, 5 per cent acetic acid.

BLUE (WORSTED).

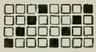
3 per cent patent blue A, 20 per cent Glauber's salt, 5 per cent sulphuric acid.

BOUCLE.

Boucle is a single cloth, dress goods fabric, weighing from 7 to 8 ounces per yard, 44 inches wide finished, and composed of plain and fancy twist (cotton) yarn in warp and filling, also having a worsted loop yarn in the filling.

Boucle is used principally as a novelty dress fabric for ladies' spring and fall suitings, the distinguishing feature of the cloth being the small loop in the filling yarn, which curls over the face of the goods.

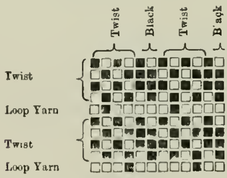

Weave


Drawing-in Draft

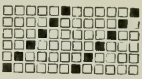

Reed Plan

BOUCLE (Woolen)

Warp, all brown. Filling, 3 brown, 1 worsted, 1 loop.



Weave


Drawing-in Draft.


Reed Plan

BOUCLE (Cotton)

COTTON BOUCLE

is generally made with a fancy combination weave, and the all-wool grades with a straight twill weave.

In the fabric boucle the loop yarn is always a worsted filling thread, twisted with a single cotton thread, generally dyed black. The color effects are either solid color in warp and filling with the loop yarn in contrast, or end and end patterns, created by using fancy colored cotton twist yarns. The colors most used are: Brown, dark blue, cadet blue, light green, drab, etc., or these same colors are twisted with a black thread for twist effects. Boucle is usually woven in the pick and pick loom, owing to the fact that there is never more than one pick of loop filling put in at one place, the arrangement generally being 4, 5, 6, 8 picks, cotton or cotton twist, to one pick of worsted loop yarn.

The woven fabric (loom) of this name is very closely imitated by a knitted fabric of similar appearance, which is a light-weight grade of astrakhan.

THE KNITTED FABRIC

is made of cotton yarns, wound in cone shape and placed upon the knitting frame, no warp being required, and the thread which forms the loop is a regular worsted thread, dyed black and wound upon a small bottle bobbin. The loops on the face of the cloth are formed by the loop wheels in the machine throwing the worsted thread between the stitching places, upon the face of the cloth in such a manner as to form a loop.

WARP PREPARATION.

The yarns can be taken direct from the twister and spooled upon small 6-inch spools and these spools assembled in the creel rack at the warp mill and the warp made in sections upon the mill drum, and afterwards run off the drum upon the loom beam: or, the yarns are taken from the twister and the entire number of spools required are placed upon a creel rack and the whole warp made by being run around an upright mill drum, which is an upright framework centred upon an axle and turned by a crank, and having a circumference of from 20 to 50 yards.

If made upon an upright mill, the warp, when finished, is pulled off and beamed.

To finish boucle, the goods are taken from the loom, and scoured in a solution of soap and cold water, after which they are rinsed in cold water, tentered and pressed.

CONSTRUCTION.

Reed, 720—49½ inches—1 end per dent, 20 picks per inch; 2-12s cotton warp and filling.

Warp pattern: 4 black and blue twist, 2 black.

Filling pattern: 4 black and blue twist, 1 black loop yarn.

Carding and Spinning Particulars.

The machines on which the counts of yarn are made in the manufacture of boucle will be found in the first division of mills, as given in a previous lesson. The warp yarn is made from a cotton fibre, as is the filling yarn, but this class of cloth has an extra filling, which is spun from a worsted fibre. This worsted filling is what is known as a loop yarn and when woven into the cloth gives it a rough surface. The loops are obtained by different methods, this one being a three-ply yarn.

THE YARN

to make the filling warp yarns for boucle is made from raw stock having a staple of about one inch. This raw stock is generally mixed, in large quantities, by hand. If two mixings are made, it is a great deal better, for then one mixing can be standing and drying out while the other mixing is being used. The good waste is mixed at this point and sometimes, although on a poor quality of goods, a small percentage of comber waste is used in the mixing. The raw stock is run through an opener and three processes of pickers. The hopper or feed box of the opener should be kept more than half full in order to obtain as even a feed as possible. The speed of the beater is 1,000 revolutions per minute.

The cotton sheet is then passed on to the feed rolls of the breaker and is struck from them by the beater, which, if of the rigid two-bladed type, makes 1,500 revolutions per minute. The total weight of the lap at the front is 40 pounds, or a 16-ounce lap. These laps are doubled, four into one, at the intermediate picker, of which the beater makes 1,450 revolutions per minute. The total weight of the lap at the front of this machine is 39 pounds, or 14½ ounces to the yard. The laps are next

DOUBLED FOUR INTO ONE

at the finisher picker. It is at this point that the cut roving waste is mixed in in the proportion of one lap cut roving to three laps raw stock. The beater of this machine makes 1,450 revolutions per minute, which gives 42 beats per inch of cotton fed. The total weight of lap at the front is 39 pounds, or a 14½-ounce lap. It will thus be seen that the doublings in a picker room, where three processes of picking are used, will be 16 against a total draft of 14.6, the individual drafts at the pickers being about 1.86 at breaker and 2.80 at the intermediate and finisher pickers. The laps are put up at the card, the draft of which for this class of goods should not exceed 100. The speed of the licker-in is 300 revolutions per minute, the top flats making one revolution every 45 minutes. The card fillet of work of this class should use No. 32 wire for cylinder and No. 33 wire for doffer and top flats (No. 32 wire equals 90s English count and No. 33 wire equals 100s). Grind wire once a month, strip three times a day, both cylinder and doffer, although some overseers strip the doffer once more. The weight of the sliver should be about 65 grains per yard and the card should produce between 900 and 950 pounds per week of 60 hours. See that your knifeblades under the licker-in are properly set. The two-knife arrangement is better than the one knife. Use

A LARGE SIZE DOFFER.

In setting your doffer to the cylinder use a No. 5 gauge. Two processes of drawing are generally used and for this class of work it is the general custom to use metallic rolls, as they are better adapted to this class of work than the leather covered top rolls. In calculating the production turned off for metallic rolls always add 33 1-3 per cent over that calculated for leather covered rolls. The sliver weighs about 70 grains per yard and with 400 revolutions per minute of front roll produces 2,100 pounds per week of 60 hours. The roving is then put through the slubber and made into 40 hank roving. It is then run through

TWO PROCESSES OF FLY FRAMES,

where it is made into 1.25 hank at the first intermediate and 2.50 at the second. The roving is then taken to the spinning room. The particulars used for a warp spinning frame making 12s yarn would be as follows: Gauge of frame, 3 inches; diameter of ring, 2⅛ inches; length of traverse, 7 to 7½; speed of spindles, 19,000; and for a filling frame spinning 12s use: Gauge of spindle, 2¾ inches; diameter of ring, 1½ inches; length of traverse, 7 inches; speed of spindle, 6,600. The yarn is then spooled, twisted into 2-ply 12s and warped, after which it is run through a slasher.

Colors for Boucle.

Following are good formulas for deing boucle:

BROWN.

10 per cent thion brown G, 10 per cent sulphide sodium, 30 per cent Glauber's, 3 per cent sal soda.

DARK BLUE.

10 per cent immedial indone B, 10 per cent sulphide sodium, 30 per cent Glauber's, 3 per cent sal soda.

CADET BLUE.

8 per cent immedial sky blue, 8 per cent sulphide sodium, 30 per cent Glauber's, 3 per cent sal soda.

LIGHT GREEN.

4 per cent immedial sky blue, 3 per cent immedial yellow D, 7 per cent sulphide sodium, 30 per cent Glauber's, 3 per cent sal soda.

DRAB.

3 per cent thion black G, ½ per cent thion brown G, 3 per cent sulphide soda, 20 per cent Glauber's, 2 per cent sal soda.

SLATE.

2 per cent immedial black N N, 2 per cent sulphide soda, 20 per cent Glauber's, 2 per cent soda ash.

BLACK.

15 per cent immedial black N B, 15 per cent sulphide soda, 30 per cent Glauber's, 3 per cent soda ash.

SCARLET.

6 per cent diamine scarlet B, 3 per cent sal soda, 30 per cent Glauber's.

RED.

6 per cent benzo fast red 4 B, 30 per cent Glauber's, 3 per cent sal soda.

COMBED YARN GOODS—COTTON LININGS.

Cotton lining is a single cloth, all cotton fabric, weighing from 2 to 2½ ounces per yard, the goods finished at 20¼ inches, including ¼ inch for white selvedge. All combed cotton warp yarns are used in the production of this fabric, which, when finished, is used principally in the manufacture of sleeve linings, and as a stiffening in the more expensive grades of ladies' and men's clothing.

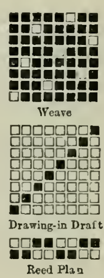
The object of treating the cotton while in the sliver state, to the additional process of combing, is to further assist in the operation of straightening out, or paralleling of the cotton fibres. Combed cotton, after being spun into yarn, produces a smooth, round, even thread.

SLEEVE LININGS

are made of combed yarns which after being dyed the required color are glazed or polished, and this process, in connection with the weave employed, generally an eight harness satin warp effect face, gives to the yarn in cloth the appearance of a close woven hair cloth fabric. The finished fabric has a very smooth, hard, even face, though not a harsh feel.

Linings are usually made in solid black color, or in fancy bright colored stripes, upon a black ground. The colors forming the stripe patterns are cherry red, cadet blue, yellow, red, brown, etc.

The glazing machine consists mainly of a large copper cylinder, four or



five feet in diameter. This cylinder is heated to a high degree of intensity by either gas or steam.

As the cylinder revolves, there are a series of rollers working against its surface, and running in an opposite direction. These rollers are set in the machine frame above the cylinder and at regular distances, in much the same manner as the workers and stripper on a woolen card.

The yarn is fed to the machine through a pair of feed rollers, from which it passes over the face of the cylinder, and under the small rollers, or, in other words, between the cylinder and the small rollers, after which it is delivered by a pair of rollers, similar to the feed rollers. The yarn is run through the machine twice, the object being to submit all parts of its surface to the friction, to cause the glaze to come up.

Linings can be woven in a single

box roller or clipper loom. Lots of trouble is thus developed by the fancy strapping required to produce the satin weave effects.

Good results are obtained by using plain, single box loom, having a dobby or witch top attached.

To finish this fabric, the goods are taken from the loom and lightly starched, then run through the calender two or three times to set the smooth, glazed finish.

CONSTRUCTION.

Reed, 1,000—23 inches in reed, two ends per dent; 62 picks 1-30s black cotton filling, 1-20s cotton (glazed warp) yarn.

Warp pattern: 10 black, 4 cadet blue, 10 black, 4 yellow. Weight, about 2¼ ounces; finish, 20¼ inches. Eight harness satin weave; warp effect face.

Carding and Spinning Particulars.

Cotton linings are made of various counts of yarn, according to what grade of linings is wanted. In this article we will consider that the cotton warp yarn is 1-20s combed, and the filling yarn 1-30s. The yarn for linings of this grade would be spun in mills of the second division, as given in a previous lesson, although yarns for linings are made in all three divisions of mills.

THE RAW STOCK

used should be of a fair grade. with a staple of about 1 5-16 inches. This is put through a bale breaker and from here carried by a series of endless lattices to its proper bin.

The bins to hold the different grades of cotton should be plainly marked on both ends, showing the kind, grade and length of staple,so that no mistakes will occur through guesswork. If different lengths of staple get mixed together it will cause a great deal of trouble at the machines, having their rolls set at a certain distance of one length of staple.

The cotton is fed to the bale breaker in the manner described in the last lesson. The cotton is allowed to dry out as much as possible before being fed to the opener. The good waste is mixed in at the bins. This class of cotton passes through an opener and either two or three processes of picking (generally two processes being used). If only two processes are used the particulars given for the intermediate picker may be omitted. Use the different speeds of the opener and pickers as given in a previous lesson. The total weight of the lap at the front end of the breaker picker is 50 pounds, or 16 ounces to the yard. This is put up at the intermediate and

DOUBLED FOUR INTO ONE

and this lap at the front end has a total weight of 37 pounds,or 12 ounces to the yard. This lap in turn is put up at the finisher picker and doubled four into one. It is at this point that the cut roving waste is mixed in in a proportion of three laps of raw stock to one lap of cut roving. The total weight of lap at the front is 35 pounds,or 12½ ounces to the yard. The laps are then put up at the card, the draft of which should not be less than 120. A large doffer should be used; the card should be stripped three times a day and ground at least once a month.

The cylinder speed is 160 revolutions per minute; speed of licker-in, 300 revolutions per minute. The top flats should make one complete revolution every 35 minutes. The production of the card should be 500 pounds per week of 60 hours, the weight of the sliver being 50 grains per yard. The sliver (in cans) to be used for warp yarn is collected and passed to the

SLIVER LAP MACHINE,

or, as it is sometimes called, the small doubler; here it is doubled 14 into 1 and made into a lap. This sheet of lap weighs 395 grains to the yard. Six of these laps are put up at the ribbon lap machine, or, as it is sometimes called, the large doubler. These are doubled into one sheet of lap, which weighs 260 grains per yard. Six of these laps are put up at the comber and made into a sliver weighing 45 grains per yard. The speed of the comber should be about 90 nips per minute. The machine is set so as to take out 18 per cent of waste. The draft of this machine for this class of cotton should be about 27.50.

This sliver is then put through two processes of drawing, the weight of the sliver at the front of the finisher drawing being 70 grains per yard. The speed of the front rolls of this machine is 350 revolutions per minute. Either metallic or leather covered top rolls may be used. The sliver is put through the slubber and made into .50 hank roving. This roving is passed through

TWO PROCESSES OF FLY FRAMES,

the hank roving at each being as follows: At first intermediate,1.50; at second intermediate, 4.50. This is then

taken to the ring spinning room and spun into 20s yarn, using a frame having a spindle gauge of 2¾ inches, a 2-inch diameter ring, a 7-inch length of traverse, a spindle speed of 9,400 revolutions per minute, and a twist per inch of 21.24. This yarn is next spooled, then warped, after which it is put through the slasher.

The weights and processes used for

THE FULLING YARNS

are different from the above. Starting at the card, the draft should be about 100; the flats make one complete revolution every 50 minutes; the sliver weighs 65 grains per yard and the production is 700 pounds per week. This is then put through three processes of drawing, the weight of the sliver at the finisher drawing being 73 grains per yard. The slubber roving is .55 hank. This is put through two processes of fly frames, the hank roving being as follows: At the first intermediate 2.00 and at the second 7.25 hank. This roving is then taken to either the ring spinning or the mule room and spun into 30s yarn. If the former, use a frame having a gauge of 2¾ inches; diameter of ring, 1⅝ inches; length of traverse, 6 inches; speed of spindles, 8,300 revolutions per minute; twist per inch, 19.17.

Dyeing Particulars.

Many of the cheap linings are dyed a logwood black. By some people logwood black is asked for, because the goods gain in weight, as logwood feeds the goods, adds weight and substance, and all artificial blacks reduce the weight of the cloth.

The logwood bath generally used is the steam black. First, the goods are padded in a solution of logwood about 5 degrees Tw., dried over steam cans, run through a solution of bichromate of soda four ounces to the gallon, and then run through a steam box, and afterwards rinsed well in water. A one-dip aniline black is also dyed in some cases, and the oxidized aniline salt black is dyed to a large extent.

The new sulphur blacks are being gradually introduced and may, in time, supersede all other blacks. But for most purposes the black obtained by logwood is all that is required.

The black and colored prints are printed with resist colors, and afterwards padded with aniline black, and finished with calendered, bettle or schreiner finish. Most finishes are very bright and glazed.

CASHMERE TWILL.

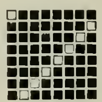
Cashmere twill is a light-weight, single cloth, weighing from 2½ to 3 ounces per yard, finished at 27 to 28 inches wide, and composed of about 1-20s cotton warp, and 1-16s to 1-20s cotton or cotton shoddy filling.

It is usually woven with an even or uneven sided twill weave, such as $\frac{2}{2}$ or $\frac{7}{1}$, the warp being all black, of dyed yarn, and the pattern being printed upon the face of the goods after the weaving operation.

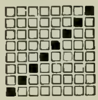
THE PATTERNS

are generally small effects, produced by printing drabs or grays upon the black ground in imitation of twist

$\frac{7}{1}$



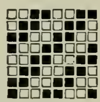
Weave



Drawing-in Draft

Reed Plan

$\frac{2}{2}$



Weave

Drawing-in Draft

Reed Plan

yarn effects, the whole forming somewhat the appearance of a fancy mixed woolen fabric.

This style of cloth was used principally in the manufacture of ladies' fall novelty suitings, and can be woven on either the plain roller loom or a medium weight loom having dobby or witch attached.

To finish this fabric, the cloth is taken from the loom and run through the printing machine to produce the pattern upon the face of the fabric, after which the goods are lightly sized and calendered.

CONSTRUCTION.

Reed, 700—30 inches in reed, 2 ends per dent—16 ends selvedge $\frac{2}{2}$ 45 degrees twill weave; 1-20s cotton warp (black); 42 picks 1-16s cotton filling.

1,166 ends plus 16 equals 1,182 ends plus 5 per cent take-up in warp in weaving equals 1,227 yards 1-20s cotton warp equals 1.17 ounces; 42 picks

times 30 inches equals 1,260 yards 1-16s cotton filling equals 1.5 ounces.

1.17 ounces warp weight plus 1.5 ounces filling weight equals 2.67 ounces per yard.

Carding and Spinning Particulars.

The warp yarn used in the manufacture of cashmere twills may be made in either the first or second division of mills as given in a previous lesson. The filling yarn may be made in a cotton mill or in a woolen mill. For this article we will consider the warp and filling yarns to be 1-20s. For this count of yarn a medium grade of cotton should be used. A bale breaker would not be used, although it would improve the yarn. The mixing would be done by hand and as large a mixing as possible would be made at one time. By doing so there will be a saving time and also a more even yarn will be secured. The bales of cotton should be sampled and mixed in the manner described in a previous lesson.

As the mixing is done by hand it should be allowed to stand as long as possible, so as to dry out, thus making the cotton

EASIER TO HANDLE.

It is at this point that the good waste from the machines up to the slubber is used. This waste should be pulled apart as much as possible before being thrown into the mixing so that it will not work around the pin beater of the opener as it is apt to do when left coiled up. The cotton is put through an opener and two processes of picking.

The speed of the beater of the opener should be about 1,700 revolutions per minute. The hopper should always be kept half full and the fly cleaned out at frequent and regular intervals. The speed of a two-bladed rigid type beater of the breaker picker for this stock should be about 1,500 revolutions per minute. The total weight at the front is 40 pounds or 16 ounces to the yard.

THE LAPS

are doubled four into one at the finisher picker, and it is at this point that the cut roving waste laps are mixed in in the proportion of three laps of raw stock to one lap of cut waste. The speed of this beater (two bladed rigid type) is 1,450 revolutions per minute. This will give the cotton passing through the machine about 42 beats per inch of cotton fed. The total weight of the lap at the front should be 39 pounds or 14 ounces to the yard. Take good care of your machines and keep them well oiled, cleaned, and set and the work will be greatly improved, both as to appearance and production. The lap is put up at the card and the draft should not exceed 100. The flats should make one complete revolution every 45 minutes.

THE CARDS

should be cleaned at least twice a day and the fly taken from underneath once a day. The stripe waste should be gathered four times a day. The cards should be stripped (doffers and cylinders) three times a day and ground once a month, except in the case of accidents, when they should be ground until the wire is level and sharp. Light grinding should always be used. Use as large a doffer as possible, use either one having a 26 or 27 inch diameter. The production of a card on this stock should be about 800 pounds for a week of 60 hours. The card sliver is then put through

THREE PROCESSES OF DRAWING FRAMES.

Metallic rolls may be used to great advantage on this grade of stock. The sliver at the front of the finisher drawing frame should weigh about 70 grains to the yard. The slubber draws this sliver into .40 hank roving. It is then put through the fly frames. The roving for warp yarns is then taken to the ring spinning room and the roving for filling may be taken to either the ring spinning or the mule room. For this class of goods the filling yarn is generally ring spun. For a warp frame spinning 20s use the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 2 inches; length of traverse, 7 inches; twist per inch, 21.24; speed of spindle, 9,400 revolutions per minute. For a filling frame use a frame having a 2¾ inches gauge, 1½ inches diameter ring, 6½ inches length of traverse, the yarn having 14.50 turns per inch, and the speed of the spindles is 7,300 revolutions per minute. The warp yarn is then spooled, warped and put through a slasher.

Dyeing Particulars.

BLACK WARP.

15 per cent sulphur black, if for jet black, immedial N N, if for blue black, immedial N B. 15 per cent sodium sulphide, 30 per cent Glauber's, 3 per cent soda ash. Dyed in a warp dyeing machine. After the goods are woven and cleaned with a good soaping and rins-

ing, they are sent to the printer and printed with different patterns and styles, to imitate mixed woolen fabrics, and are then finished and made up like woolen goods.

BAYADERE MADE ENTIRELY OF MERCERIZED COTTON.

In a previous article a description was given of a "bayadere" fabric, in which the materials of which it was constructed were cotton, worsted and silk and whose foundation was a "rep" weave.

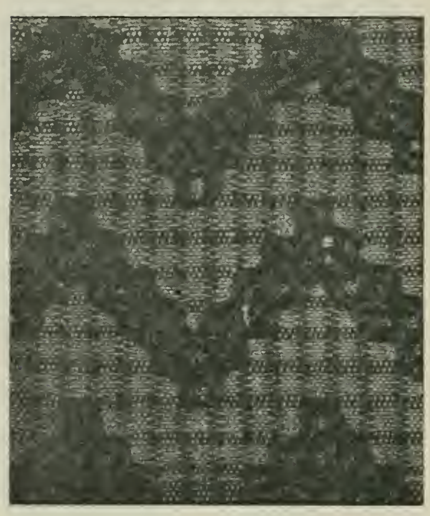


Fig. 1.

It is now intended to show another "bayadere" fabric, but which is composed entirely of mercerized cotton and whose structure is based upon the plain weave, the finished width 36 inches and the weight 4¾ ounces per finished yard.

Such a fabric is shown in Fig. 1, which is a very good illustration of this class of patterns, whose chief feature is the zigzag stripe extending across the cloth in the direction of the weft.

The size and elaborate effect of this pattern make it resemble a jacquard effect, but it can in fact be produced on a comparatively low number of harnesses.

Fig. 2 shows the full design. which is complete on 64 warp threads and 48 picks.

As before mentioned, the plain weave is used as the

BASIS OF THE FULL DESIGN,

and between the stripes (ground) all the threads are interlaced on the plain weave and form a single cloth; but the stripes themselves (figure) are formed by lowering all the fine threads (marked | at top of full design, Fig. 2) and raising all the coarse threads (marked .) to the surface of the cloth and thus forming a double cloth, with each of the two single cloths thus formed interlaced with the plain weave, throughout the stripe or bayadere.

Fig. 3 illustrates the drawing-in draft, which requires 18 shafts, 10 for the ground and 8 for the figure threads.

Fig 4 shows the reeding pan.

The material and arrangement of the threads are as follows:

Warp: 6 threads 2-40s blue mercerized cotton (one in a heddle), four threads 2-20s black mercerized cotton (two in a heddle); total, 10 threads in one repeat of pattern.

950 reed—38½ inches wide to finish 36 inches, 40 picks per inch.

Filling: 6 picks 2-40s blue mercerized cotton (single), 2 picks 2-20s black mercerized cotton (double); total, 8 picks in one repeat of pattern.

Fig. 5 shows the chain draft required. The back picks must positively come on the bars marked.

It will be noted that the black 2-20s cotton used in the warp is introduced 2 threads in one heddle, and in the weft the same yarn is wound double, or two threads on a bobbin, which is done for the following reason: In many cloths from which this particular pattern was derived the black cotton used was very much heavier, that is, about 2-10s or 2-12s, with one thread introduced in one heddle, instead of two threads, which made the fabric appear very coarse and open in texture; therefore, by using two threads of 2-20s the same weight of yarn is employed, but being finer and the two threads lying side by side, the cloth is given a much finer and closer texture.

COLORS.

In cloths of this description the bayadere stripe is generally black, which gives very great freedom in the choice of colors for the ground, as any good color may be combined with black, without any danger of the other suf-

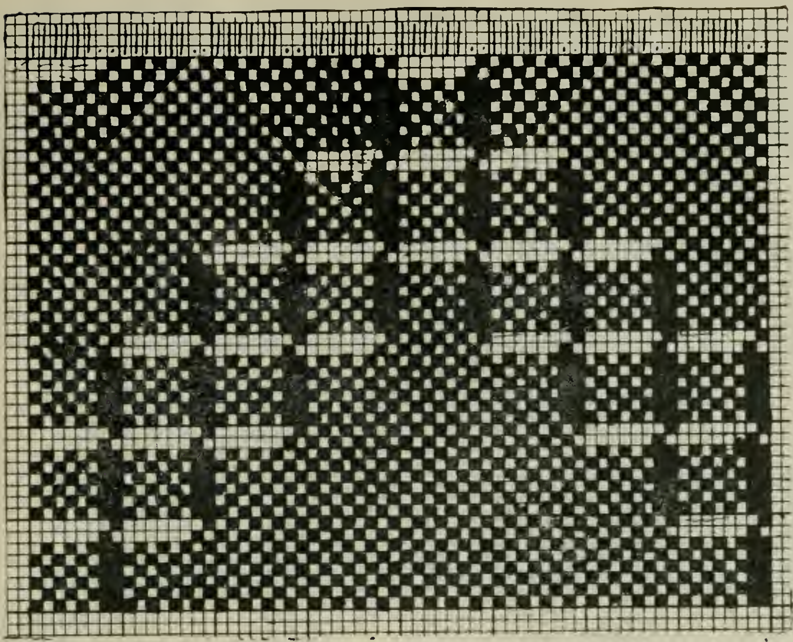


Fig. 2.

Drawing-in Draft.

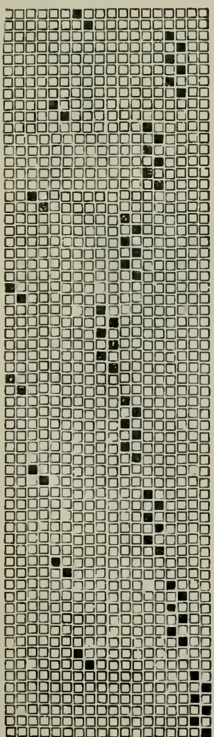


Fig. 3.

Reeding Plan.

Fig. 4.

Chain Draft.

Front.

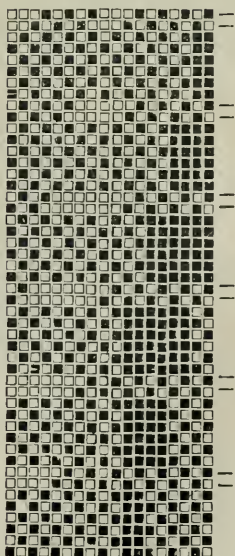


Fig. 5.

fering by being placed in juxtaposition.

THE REQUIRED LOOM.

In selecting the kind of loom for weaving the above cloth, almost any make of loom can be used which will carry 20 shafts and have the capacity of carrying at least 2 shuttles.

FINISH.

A dry finish only is required for this fabric and the process is as follows: After being burled and mended the cloth is brushed and steamed and then pressed so as to give as much lustre as possible. After being rolled, the cloth is then ready for shipment.

Dyeing Particulars.

PURPLE.

On a tannine and tartar emetic mordant, dye in fresh bath, 1 per cent methylviolet 3R.

On tannine mordanted yarn dye with ½ per cent rhodamine 5G, which dyes a pink; for a rose use 2 per cent color.

SCARLET.

3 per cent diamine scarlet, 30 per cent Glauber's, 3 per cent sal soda.

CHINA BLUE.

On tannine mordanted yarn dye 1 per cent new methylene blue GG.

SKY BLUE.

3 per cent diamine sky blue, 30 per cent Glauber's, 3 per cent sal soda.

NAVY BLUE.

4 per cent diamine black B H, 30 per cent Glauber's, 3 per cent sal soda.

TURQUOISE BLUE.

On a tannine mordant dye 1½ per cent turquoise blue G.

EMERALD GREEN.

On a tannine mordant dye 2 per cent emerald green cryst.

LIGHT BROWN.

½ per cent diamine fast yellow B, 1 per cent diamine brown B, 20 per cent Glauber's, 3 per cent sal soda.

BROWN.

2 per cent tetrazo brown R, 1 per cent tetrazo brown G G, 30 per cent Glauber's, 3 per cent sal soda.

RED.

4 per cent benzo fast red 4 B S, 30 per cent Gauber's, 3 per cent sal soda.

HELIOTROPE.

2 per cent tetrazo lilac R, 30 per cent Glauber's, 3 per cent sal soda.

ORANGE.

2 per cent tetrazo orange TR, 30 per Glauber's, 3 per cent sal soda.

SLATE.

½ per cent diamine black B H, ½ per cent oxydiamine black A, 30 per cent Glauber's, 3 per cent sal soda.

PIQUE.

Pique is a heavy cotton material woven in corded or figured effects. The goods are used for such purposes as

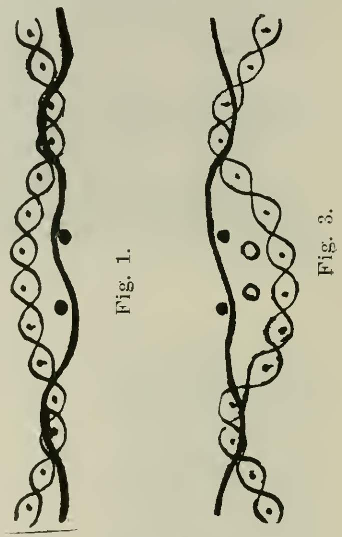


Fig. 1. Fig. 3.

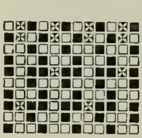


Fig. 2.

ladies' so-called tailor-made suits, vestings, shirt fronts, cravats, bedspreads and the like.

The plainest and most common fabrics of pique are those in which the pattern consists of straight cords extending across the cloth in the direction of the weft. In

THE CONSTRUCTION

of these fabrics both a face and a back warp are required and the cords are produced by all the back warp threads being raised at intervals of 6, 8, etc., picks over two or more picks of the face cloth, which has a tendency to draw down on the sur-

face of the fabric. The goods are always woven white and no colors are ever used.

The face warp threads are generally finer than the back warp threads and are in the proportion of two threads for the face and one thread for the back.

cloths, as illustrated by the diagram Fig. 3. See dots o.

In the lightest and cheapest grades, neither any wadding nor back picks are used. In this case the back warp threads float on the back of the fabric, except when raising over the face picks to form the cord.

Design.

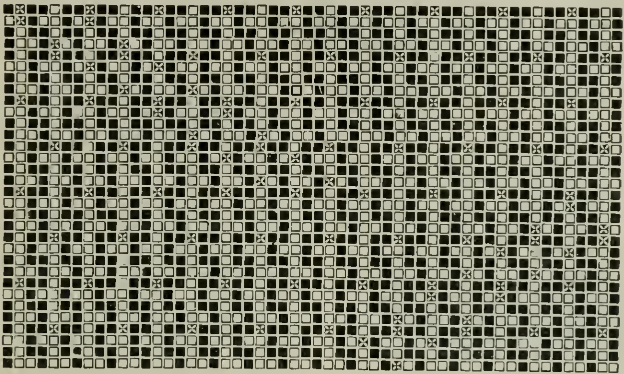


Fig. 4.

In the diagram Fig. 1, which is a sectional cut of a fabric woven with the design Fig. 2, the heavy black lines represent the back warp threads, and it will be noticed that they are raised over two of the face picks, represented by the small dots (.).

The heavy dots (.) represent the back picks, which interlace with the back warp threads only. The fine lines represent the face warp threads.

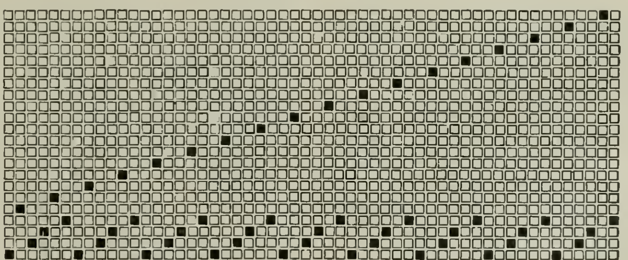
In the heavier and better grades of pique, heavy or coarse picks, called wadding, are used to increase the weight and also to give more prominence to the cord effect. They are introduced between the face and back

FIGURED PIQUE.

In the figured pique the binding of the back warp threads into the face cloth is not done in straight lines as in the plain pique, but the binding points are introduced so as to form figures.

These fabrics are woven in the white and the figures are purely the result of binding the face and back cloths together. As a result of this method of binding, the cloth is characterized by the embossed appearance of the figures. In the best grades heavy wadding picks are used and these tend to greatly heighten the raised effect of the figures. The effect produced is about the same as when two light

Drawing-in-Draft.



Reeding Plan.

Fig. 5.

cloths are laid together with wadding between and then stitched together on a sewing machine, the stitching being in the form of figures.

White Marseilles bedspreads are the highest and most elaborate form of piques, and in these the pattern covers the entire spread. Geometrical figures, birds, foliage and most every conceivable manner of form are used, and all being embossed, the ultimate effect is very fine. In the example which we shall take, a small figure pique is given, with the following for the

ANALYSIS OF THE FABRIC:

Width of warp in reed (without selvedge), 38 inches; width of fabric finished, 36 inches; ends per inch, 100; ends in warp, 3,600—1,200x3 reed.

Take-up of warp during weaving, 8 per cent; weight of fabric, per yard, from loom, 9¾ ounces; shrinkage of fabric in length during finishing, 2 per cent; finished weight 9 ounces.

Chain Draft.

Front.

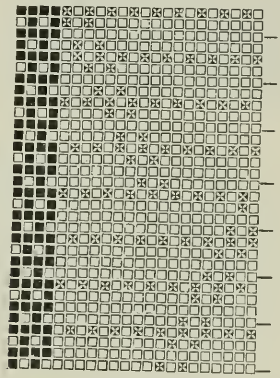


Fig. 6.

Dressing: 3 threads in pattern. One thread 1-30s white carded peeler cotton; 1 thread, 2-30s white carded peeler cotton; 1 thread, 1-30s white carded peeler cotton; equals 3.

Filling: 4 picks repeat of pattern, 168 picks per inch. One pick, 1-30s white carded peeler cotton; 1 pick 1-9s white carded peeler cotton; 2 picks, 1-30s white carded peeler cotton; equals 4.

In Fig. 4 is shown the full design.

Fig. 5 illustrates the drawing-in draft on 22 harnesses—4 required for the face warp threads and 18 for the back warp threads. The reeding plan is also given.

Fig. 6 is the required chain draft.

LOOM REQUIRED.

For the plain pique a dobby loom having drop boxes and from 4 to 16 shafts only is required, but for the figured pique a loom of more intricate construction is required and the Crompton & Knowles Loom Company build a loom especially adapted for the purpose. Their jacquard machine, which is of the rise and drop type, is especially adapted for the weaving of Marseilles quilts, and has features that dispense with the so-called "plain card," using only the figure card.

FINISHING.

These fabrics, after being scoured and bleached, are hot pressed, rolled or folded, and are then ready for shipment.

Carding and Spinning Particulars.

Pique is made up in various ways and is constructed of yarns, the count of which varies from very coarse to very fine. The fabric which is described is considered as being made up of 1-30s and 2-30s in the warp and 1-30s and 1-9s in the filling. For making this grade of cloth the machinery found in the second division of mills would be used.

THE COTTON USED

would be a good grade of "peeler," of about 1 5-16th inches staple. This cotton would be brought from the storehouse and each bale sampled; all those bales not up to sample should be laid one side. The bales of the same length of staple should be opened and fed to the bale breaker alternately from each bale in small lots at a time. From the bale breaker the cotton is carried to the bins by lattice work or by trunking and a blower and fan. The mixing should be allowed to stand in the bins as long as possible before being used, so that the cotton will be free from moisture. It is at this point that the

GOOD WASTE

from the machines up to the slubber is mixed in, the sliver being torn into short lengths before being thrown into the mixing. The raw stock is put through an opener and either two or three processes of picking. If three processes of picking are used for the intermediate picker the same particulars are followed as in the case of the finisher except where noted.

The hopper of the opener should be always kept more than half full of raw stock, so as to feed an even sheet of

cotton to the breaker picker. The speed of a porcupine beater of this machine should be about 1,050 revolutions per minute. The speed of a two-bladed rigid type beater for the breaker picker should be 1,500 revolutions per minute, the fan speed being 1,400 revolutions per minute. The total weight of the lap at the front should be 40 pounds, or a 16-ounce lap. If an intermediate picker is used, the laps are doubled four into one and the

TOTAL WEIGHT OF THE LAP

at the front should be 37 pounds, or a 13-ounce lap. These laps are put up at the finisher picker and doubled four into one. At this point the cut roving waste is mixed in, in the proportion of one lap of waste to three laps of raw stock. The speed of the beater should be about 1,450 revolutions per minute, which gives the cotton passing through the machine about 42 beats or blows per inch. The total weight of the lap at the front should be 35 pounds, or a 12½-ounce lap. Look out for your fan drafts to see that they are properly regulated so as to obtain an even lap. The laps are then put up at the card.

THE CARD

should have a draft of not more than 100. The count of wire fillet used should be medium, the wire for the tops and doffer being one number finer than for the cylinder. The card should be ground at least once a month and should be stripped three times a day. The flats should make one complete revolution every 50 minutes. Use a large doffer, either 26 or 27 inches in diameter. The weight of the sliver should be 65 grains per yard, the production for a week of 60 hours being 750 pounds. The sliver is put through three processes of drawing frames, the speed of the front roll being 350 revolutions per minute. The doublings are 6 into 1. The draft of the first intermediate is about 5.5, the second 5.75, and the third 5.75; the sliver weighing at the front of the finisher about 72 grains per yard. The sliver is then put up at the slubber and made into .50 hank roving. This roving is then put through

TWO PROCESSES OF FLY FRAMES,

the hank roving at the first intermediate being 2.00 and at the second being 7.50. This makes all the roving for this cloth, except for the 9s. This is made from a 2.00 hank roving. The roving for warp yarns is taken to the spinning room and made into 30s yarn. From here it is spooled and part of it twisted into 2-30s yarn, after which it is warped and slashed. The filling yarn may either be mule or ring spun. We will consider this yarn to be ring spun. The particulars to use for No. 30s would be as follows: Gauge of frame, 2¾ inches; diameter of ring,1⅜ inches; length of traverse, 6 inches; speed of spindle, 8,300 revolutions per minute; to spin 9s use 1⅝-inch diameter ring, 7-inch traverse, and a spindle speed of 6,200 revolutions per minute. Part of the 30s yarn is twisted into 2-30s.

Dyeing Particulars.

PEARL.

Dye in the jigger dyeing machine with 15 gallons liquor, 50 pounds weight of goods,175 degrees F.,one-half pound of soda ash, one-half pound sulphide sodium, 1 pound common salt, 3 ounces immedial black V ex., 1 ounce immedial brown B. Run the goods for 40 minutes; add in two portions the dyestuffs; rinse and aftertreat with ½ per cent bichromate potash, ½ per cent sulphate copper, at 170 degrees F., and rinse well. Give a weak soaping if required.

CREAM.

Dye with the same proportions as for pearl, and in the same way, with one-half ounce immedial yellow D, one ounce immedial cutch G.

BUFF.

Dye with same proportions as pearl, with 6 ounces immedial bronze A.

LIGHT SLATE.

Dye with same proportions as pearl, 6 ounces immedial black V.

DRAB.

As light slate; 2 ounces immedial black V; 6 ounces immedial bronze A.

LIGHT BROWN.

On the jigger,as pearl; 3 per cent immedial cutch G, 3 per cent sodium sulphide, 3 per cent soda ash, 15 per cent common salt.

LIGHT OLIVE DRAB.

Dye as pearl; one-half pound pyrogene yellow M; 14 ounces pyrogene olive N; 4 ounces pyrogene cutch 2G; aftertreat as pearl.

MADRAS GINGHAM.

Madras gingham is distinctly a shirting fabric and is an article of fine quality. Zephyr gingham is a dress gingham and is lighter and of softer finish than the madras gingham.

Madras gingham is distinguished from the common gingham by the fineness of the texture and the richness of the patterns employed. In the common gingham the plain weave is chiefly used and the patterns consist only of stripes and checks formed by contrasting colors—principally white with some other color—and is chiefly made on roller looms.

The Fabric.

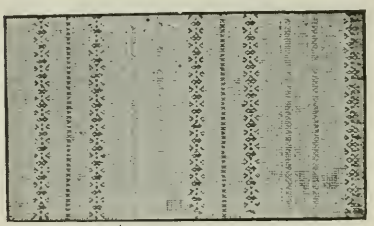


Fig. 1.

In the madras ginghams

VARIOUS WEAVES ARE USED

in combination with the plain weave which is always used for the ground, while very often leno weaves are introduced for ornamentation.

The number of colors used in conjunction with white often reaches as high as five and six in a single pattern, while printed yarns are extensively used with fine effect.

Fig. 1 is a very neat illustration of a madras gingham in a leno stripe effect. The chief features of this pattern are the leno diamond stripe on a background of old rose, and the heavy cords of white and of tan. The blue stripe between the white cords is also a prominent feature.

ANALYSIS OF THE FABRIC.

Width of warp in reed (selvedge included), 29½ inches; width of fabric, finished, 28 inches; size of reed required, 1,600—ends per dent, 2 and 3; ends in warp, 2,616.

Take-up of warp during weaving as follows: 1-50s plain weave, 1½ per cent; 3-50s cords, 0 per cent; 3-50s leno whip threads, 50 per cent.

Number of beams required, 3 (on account of the various take-ups). Weight of fabric per yard from loom, 1¾ ounces.

Shrinkage of fabric in length during finishing, 2 per cent. Finished weight, 1.92 ounces.

Pattern for beaming:
136 threads per pattern.
19 repeats of pattern in warp.

x 4 threads 1-50s white cotton.
0 1 thread 3-50s white cotton.
x 2 threads 1-50s tan cotton.
0 1 thread 3-50s white cotton.
x 10 threads 1-50s white cotton.
* 1 thread 3-50 white cotton.
x 6 threads 1-50s fr. blue cotton.
* 1 thread 3-50s white cotton.
x 8 threads 1-50s white cotton.
0 2 threads 1-50s fr. blue cotton as 1.
x 8 threads 1-50s white cotton.
* 1 thread 3-50s white cotton.
x 6 threads 1-50s fr. blue cotton.
* 1 thread 3-50s white cotton.
x 10 threads 1-50s white cotton.
0 1 thread 3-50s white cotton.
x 2 threads 1-50s tan cotton.
0 1 thread 3-50s white cotton.
x 6 threads 1-50s white cotton.
0 1 thread 3-50s white cotton.
x 2 threads 1-50s tan cotton.
0 1 thread 3-50s white cotton.
x 10 threads 1-50s white cotton.
x 2 threads 1-50s fr. blue cotton.
* 1 thread 3-50s white cotton.
x 2 threads 1-50s fr. blue cotton.
* 1 thread 3-50s white cotton.
x 2 threads 1-50s fr. blue cotton.
x 8 threads 1-50s white cotton.
0 2 threads 1-50s fr. blue cotton as 1.
x 8 threads 1-50s white cotton.
x 2 threads 1-50s fr. blue cotton.
* 1 thread 3-50s white cotton.
x 2 threads 1-50s fr. blue cotton.
* 1 thread 3-50s white cotton.
x 2 threads 1-50s fr. blue cotton.
x 10 threads 1-50s white cotton.
0 1 thread 3-50s white cotton.
x 2 threads 1-50s tan cotton.
0 1 thread 3-50s white cotton.
x 2 threads 1-50s white cotton.

Total 136 threads.

Put threads marked x on bottom beam.

Put threads marked 0 on middle beam.

Put threads marked * on top beam.

1-50s cotton must be well sized.

Number of threads of each color in

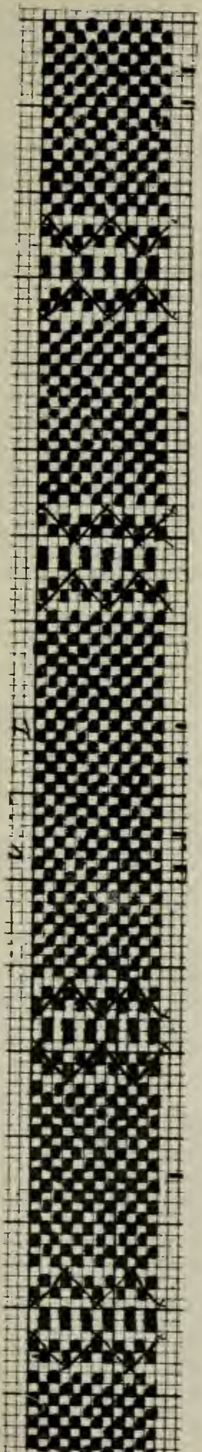
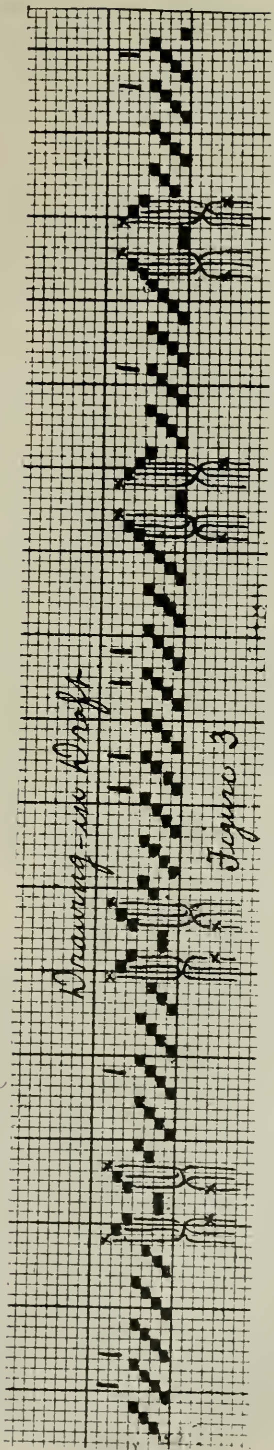


Fig. 2.



Reeding Plan.
Fig. 4.

pattern: 1-50s white, 84; 1-50s tan, 28; 1-50s fr. blue, 8; 3-50s white, 16; total, 136.

Number of threads of each color in warp: 1-50s white, 1,628; 1-50s tan, 532; 1-50s fr. blue, 152; 3-50s white, 304: total, 2,616.

Filling: 72 picks per inch; all white 1-60s cotton.

The full design is illustrated at Fig. 2, and is complete on 136 warp threads and 12 picks. The drawing-in draft is illustrated at Fig. 3, and is complete on 7 harnesses and 2 doup shafts.

Fig. 4 is the reeding plan.

Fig. 5 is the harness chain draft for 12 bars.

THE LOOM REQUIRED.

Ordinarily to produce a leno fabric like the madras cloth above analyzed a close shed loom is required, and with the harnesses raising and lowering at every pick it necessarily requires a comparatively slow speed; but the Crompton & Knowles Loom Company build a dobby (open shed) known

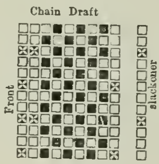


Fig. 5.

as the Stafford dobby,which is especially adapted for the weaving of leno cloths and all descriptions of cotton goods that can be produced on 20 harnesses, which is the limit of its capacity. This is the best loom that is on the market to-day for weaving these goods. The loom should be built with a 42-inch reed space and with 4x4 boxes.

FINISH REQUIRED.

After these goods are received from the looms they must be examined carefully and all spots of dirt and grease removed, the selvedges trimmed and all runners (that is, filling pulling in at the sides) and also bunches and large knots must be taken out.

They are then run through a starching machine and given a medium starching.

They are then run through a calender, which flattens out the threads and removes all wrinkles and gives the cloth a much smoother surface, besides giving it an appearance of finer texture.

After measuring and rolling, the pieces are put in a hydraulic press and submitted to a pressure of many tons weight. They are then labeled and papered and are then ready for shipment.

Carding and Spinning Particulars.

The machinery required to make the yarns for madras ginghams will be found in mills of the second division, although mills of the third division (as given in a previous lesson) also make this grade of yarn.

THE COUNT OF YARN

which we will consider in making this class of goods is 1-50s and 3-50s for the warp yarns and 1-60s for the filling. This stock is made out of a good grade of cotton, the staple of which is about 1½ inches to 1⅝ inches in length. The cotton is brought to the picker room and sampled and graded by the overseer in charge of the card room, although in large mills when a cotton sampler is employed he also is present at mixing time.

The bales of cotton are sampled and all those of the same length are placed together. After the lot is sampled, a few (four or five) bales are placed around the bale breaker and fed to this machine, a small lot being taken from each bale alternately, until all the cotton is gone. The bagging which comes around the cotton is then placed in a pile, where later it will be picked clean of all cotton and then it is placed with other bagging, which is sold. The ties which bind the bales are also sold.

THE BALE BREAKER.

The draft of a bale breaker is quite large, but as the cotton is in large lumps it only acts on it by pulling it apart so that a good deal of the draft is lost. The production of a bale breaker is from 80,000 to 90,000 pounds per week.

The cotton is conveyed by endless lattices from the bale breaker to the bins; sometimes a blower and trunks are used in connection with the lattices. Where one is used it has been found that the cotton is in better shape to work and does not have to be dried out as long in the bins. Large mixings should always be used for the reasons given in previous articles.

At the bins the sliver waste of the same length and grade of cotton is mixed into the raw stock. As this is generally done by the man that collects the waste, it is always a good plan to watch him to see that he puts the waste that he has collected in its

proper bin. The raw stock for this class of goods is put through a porcupine opener and

TWO PROCESSES OF PICKING.

Keep the hopper of the opener more than half full of raw stock, because by so doing a more even feed will be obtained and this will help to make an even yarn. The speed of the beater of the opener should be about 1,050 revolutions per minute. The cotton is passed up to the feed rolls of the breaker picker. There are two of these rolls, top and bottom, and they present a sheet of cotton to the beater, which is generally of the two-bladed variety. This beater has a speed of about 1,500 revolutions per minute, and the fan a speed of 1,400 revolutions per minute. The total weight of the lap at the front end of the breaker picker is about 40 pounds, or what is called a 16-ounce lap, meaning that each yard of lap weighs 16 ounces.

The laps are taken from the breaker picker and put up at the finisher picker, the doubling (or number of laps put up) being 4 into 1. It is at this point that the cut roving, of the same length and grade, is mixed in, it having first been put through a special process, which takes out the twist, and also a picker, which forms into a lap. The proportion of cut waste used is one lap of cut waste to three laps of raw stock. The beater of the finisher picker makes 1,450 revolutions per minute. The total weight of the lap at the front of the finisher picker is about 35, or a 12½-ounce lap for both warp and filling yarn. The lap is put up at

THE CARD.

The draft of this machine for this class of goods should not be less than 110; the wire fillet used on the cylinder should be No. 34 wire or No. 110 English count, and on the doffer and top flats No. 35 or No. 20 English count wire should be used. The cards should be ground once every three weeks and stripped (doffer and cylinder) three times a day. The cards should be thoroughly cleaned twice a day and wiped down twice more.

The speed of the cylinder should be 165 revolutions per minute, the licker-in speed 290 revolutions per minute. The top flats should make one revolution every 34 minutes. The weight of the sliver at the front end should be 65 grains, and the production 600 pounds per week of 60 hours. Use a larger diameter doffer, either 26 or 27 inches. On some grades of madras ginghams the filling yarn is combed, but as we have put the cotton in this article through what is called fine carding we will consider that both the warp and filling yarns are to be only carded. The sliver is taken from the card and put through

THREE PROCESSES OF DRAWING FRAMES.

The doublings of these machines are six into one. The weight of the sliver at the finisher drawing frame is 70 grains. Look out to see that the top rolls are all properly varnished and in good repair, or are thoroughly cleaned if metallic rolls are used; see that all stop motions are in proper working order and that the help keep the machine running. The drawing sliver is put through the slubber and made into .50 hank roving. From here it is put through three processes of fly frames and made into 10 hank for 50s count yarn and 12 hank for 60s yarn. In 10-hank roving the hanks made at the different processes are as follows: 2 at first intermediate, 4 hank at second intermediate and 10 hank at the jack frame. For 12 hank it is 2 hank at first intermediate, 4 hank at second intermediate and 12 hank at the jack frame. The roving for warp yarn is carried to

THE RING SPINNING ROOM

and spun into 50s yarn on a frame having the following particulars: 2¾ inches gauge of frame; diameter of ring 1½ inches; length of traverse, 6 inches; speed of spindle, 10,000 revolutions per minute. This yarn is then spooled and the yarn for the plain weave is then warped and then put through a slasher. The following mixing may be used for heavy counts: Water, 100 gallons; potato starch, 65 pounds; tallow, 6 pounds; Yorkshire gum, 3 pounds; white soap, 2 pounds; boil 1¾ hours. The 50s count yarn for cords and leno whip threads after being spooled is twisted into 3-ply 50s yarn on the twister machine.

The 12-hank roving for filling yarn may either be ring spun or mule spun. If ring spun, use a frame having the following particulars: for 60s gauge of frame, 2¾ inches; diameter of ring, 1¼ inches; length of traverse, 5 inches; speed of spindle, 8,000 revolutions per minute.

Dyeing Particulars.

YELLOW.

1 per cent tetrazo chlorine yellow GG, 30 per cent Glauber's, 3 per cent sal

soda; aftertreat with ½ per cent bluestone, ½ per cent chrome.

LIGHT ORANGE.

1 per cent tetrazo chlorine orange R, 30 per cent Glauber's, 2 per cent sal soda; aftertreat with ½ per cent bluestone, ½ per cent chrome.

OLD ROSE.

½ per cent tetrazo chlorine rose, 25 per cent Glauber's, 2 per cent sal soda; aftertreat with ½ per cent bluestone, ½ per cent chrome.

LIGHT OLIVE.

4 per cent pyrogene olive N, 4 per cent sulphide soda, 30 per cent Glauber's, 3 per cent soda ash; aftertreat with 1 per cent bluestone, 1 per cent chrome.

LIGHT TAN.

4 per cent pyrogene cutch 2G, 4 per cent sulphide soda, 30 per cent Glauber's, 3 per cent soda ash; aftertreat with 1 per cent bluestone, 1 per cent chrome.

SKY BLUE.

½ per cent diamine sky blue FF, 25 per cent Glauber's, 3 per cent sal soda; aftertreat with ½ per cent sulphate of copper.

LILAC.

½ per cent damine brilliant blue G, 25 per cent Glauber's, 3 per cent sal soda; aftertreat: ½ per cent sulphate of copper.

PEARL.

4 ounces diamine dark blue B, 4 ounces diamine brilliant blue G, 25 per cent Glauber's, 3 per cent sal soda; aftertreat: ½ per cent sulphate of copper.

BUFF.

2 ounces diamine catechine 3 G, 2 ounces diamine catechine B, 25 per cent Glauber's, 3 per cent sal soda; aftertreat: ½ per cent sulphate of copper, ½ per cent chrome.

LIGHT BROWN.

10 per cent katigen yellow brown GG, 2 per cent katigen brown V, 10 per cent sulphide sodium, 3 per cent soda ash, 30 per cent salt; aftertreat: 4 per cent bluestone, 4 per cent chrome, 3 per cent acetic acid.

DARK BROWN.

5 per cent diamine catechine B, 4 per cent diamine catechine G, 30 per cent salt, 3 per cent sal soda; aftertreat: 3 per cent bluestone, 3 per chrome.

RED BROWN.

5 per cent diamine brown M, 30 per cent Glauber's, 3 per cent sal soda; aftertreat: 2 per cent bluestone, 2 per cent chrome.

PINK.

½ per cent benzo fast pink, 2 B L, 20 per cent Glauber's, 2 per cent sal soda.

RED.

6 per cent primuline, 30 per cent Glauber's, 3 per cent sal soda; diazotize and develop with beta naphthol.

WINE.

As red. Diazotize and develop with Bordeaux developer.

SLATE.

2 per cent diamine jet black SS, 30 per cent Glauber's, 3 per cent sal soda, aftertreat with 3 per cent chrome.

BLACK.

6 per cent diamine black B, 30 per cent Glauber's, 3 per cent sal soda; diazotize and develop with phenylene diamine.

SULPHUR BLACK.

10 per cent immedial black V, 10 per cent sulphide sodium, 30 per cent Glauber's, 3 per cent soda ash; aftertreat: 3 per cent chrome, 3 per cent bluestone, 3 per cent acetic acid.

LIGHT GREEN.

On tannine and tartar emetic mordant. Dye: 1 per cent new methylene blue GG, 1 per cent thioflavine T.

BLUE.

On tannine and tartar emetic mordant. Dye: 2 per cent new methylene blue GG.

INDIGO BLUE.

10 per cent immedial indone 3 B, 10 per cent sulphide soda, 30 per cent Glauber's, 3 per cent soda ash; aftertreat: 3 per cent sulphate of copper.

ETAMINE.

An etamine is a thin, slightly glossy fabric used principally for women's dress goods. Being a very popular material for summer wear, it is usually made in what is commonly known as a piece dyed fabric, that is, woven with undyed yarn. A good reason for making it a piece dyed fabric is that it is much cheaper than if the yarn is dyed previous to the weaving. Etamines are dyed in almost any color. Blue, black, red and various shades of drabs seem to be very popular. The interlacing of the warp and weft is on the one and one order, or plain weave.

See design, Fig. 1. The openness or transparency of the fabric is due partly to the smooth, hard-twisted yarn and partly to the weave.

Etamines were originally made with worsted yarns, which, of course, are much more expensive; however, if a good quality of cotton is used there is little difference in appearance between worsted and cotton etamines. The difference would be chiefly in the wearing quality, worsted of course being more durable.

The principal feature of an etamine is to have it a crisp,glossy and an open fabric.

ANALYSIS OF FABRIC.

Width of warp in reed, 27½ inches; width of fabric finished, 26 inches. Reeed, 500—2 ends per dent.

Total ends in warp 740, including selvedge. Take-up of warp during weaving, 12 per cent. Weight of fabric from loom, 3 ounces per yard; weight of fabric, finished, 3 ounces per yard.

No shrinkage during the finishing process.

WARPING PLAN.

1-10s carded peeler cotton, hard twist, 20 turns per inch, a left-hand twist.

FILLING PLAN.

28 picks per inch finished; 28 picks per inch in loom; 1-10s carded peeler cotton, hard twist, 15 turns per inch, a left-hand twist.

Notice that warp and weft are both the same twist, that is, both are a left twist. This is an important factor which cannot be ignored in making an open or transparent fabric.

The warp is drawn in straight, that is, 1, 2, 3, 4 (see Fig. 3.), until all the harnesses are used; four harnesses would be quite enough for a fabric of this character; there being but 26 ends per inch would cause no overcrowding of heddles. Fig. 3 is the reeding plan. Fig. 4 shows the chain draft for a dobby loom.

LOOM REQUIRED.

This character of fabric could be woven on any roller or dobby loom, a roller loom being preferable, principally on account of the comparatively low rate of expense the latter could be operated at.

FINISH.

Etamines, as before mentioned, are usually woven with undyed yarns, or in the gray. The cloth, after reaching the dyehouse, is first subjected to a scouring process, then dyed, after which it is given a medium sizing; then it is calendered, which in a great measure accentuates the gloss upon the fabric and also imparts to it the crisp feeling which characterizes an etamine.

It is then measured,rolled and papered, after which it is ready for the merchant. Cotton etamine sells from 12 cents to 20 cents per yard.

Carding and Spinning Particulars.

The cloth of which the weaving particulars have been given is sometimes made of all cotton yarn or a combination of cotton and wool or cotton and linen, or a combination of wool, silk linen and cotton fibres. For the carding and spinning particulars of this lesson we will consider that the fabric is made up of cotton yarns in both the warp and filling.

The count of the yarn we will consider to be 10s.

THE YARNS

for this class of cloth may be made in either the first or second division

Full Design

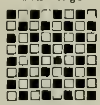


Fig. 1.

Reed Plan

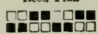


Fig. 3.

Chain Draft

Fig. 4.

Drawing-in Draft

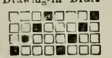


Fig. 2.

of mills, as given in a previous article. Generally, however, the mill of the second division is used. The cotton used would be peeler of about 1¼ inches length of staple. A number of bales (enough for a mixing) should be brought from the cotton shed and placed in the picker room. The overseer should sample each of the bales and those not up to staple should be placed to one side. Several of the other bales should be placed around the bale breaker and a little fed to the breaker from each bale alternately This will help to produce a

MORE EVEN MIXING,

which will help to give a more evenly finished yarn. The bales that have been laid aside should either be used in a cheaper mixture or should be shown to the cotton broker and either returned or have an allowance made for them. The bale breaker should be kept on this cotton until it is all put through. The cotton is conveyed from

the bale breaker to the mixing bin by endless lattices,which is the old method, or by having a blower and trunking and an endless lattice as is the newer and more modern method.

When a blower is used in conjunction with the bale breaker the cotton is in a more dried out condition when it reaches the bin and consequently it does not have to stand as long to dry out before using. A blower will pay for its first cost many times over. At the mixing bin the good waste from all machines up to the slubber is mixed in as it is collected. The cotton is next fed to the opener and

WHEN A BLOWER IS USED.

passed through two processes of picking when the cotton is mixed by hand. These processes of picking are generally used. A three-process picking and an opener are given, but when two processes are used all that is necessary to do is to drop the second or intermediate process and use the particulars of the breaker and finisher picker. A porcupine beater is generally used in connection with the opener and this has a speed of about 975 revolutions per minute.

The cotton passes from the opener to the breaker picker and after passing the feed rolls it comes in contact with the beater,which is generally of a rigid two-bladed type, the speed of which is about 1,500 revolutions per minute. The total

WEIGHT OF THE LAPS

at the front of the breaker picker is about 40 pounds or a 16-ounce lap. These laps are doubled four into one at the intermediate picker, the beater of this picker making 1,450 revolutions per minute and the total weight of the lap being 37 pounds or about a 12-ounce lap. The doublings at the finisher picker are four into one, the speed of the beater 1,450 revolutions per minute, which gives the cotton passing through it 42 beats per minute.

It is at this point that the cut roving of peeler stock of the same length is mixed in, in the proportion of one lap of roving waste to three laps of good cotton. The total weight of the cotton lap at the front for this class of goods is 35 pounds or a 12½-ounce lap. The next machine through which the cotton passes is

THE CARD.

This machine for this class of goods has a draft of about 90. The cards should be stripped three times a day and should be ground at least once a month. The flats make one complete revolution every 35 minutes. The production should be about 750 pounds for a week of 60 hours. The weight of the sliver at the front should be about 65 grains. Use as large a doffer as possible, either of a 26 or 27 inch diameter. The carded sliver is then put through three processes of drawing, the weight of the sliver at each process being as follows: 77 grains at breaker drawing, 76 grains at intermediate and 72 grains at finisher drawing, the doubling at each process being six into one. On this class of goods metallic top rolls may be used to good advantage. The sliver is next put through the slubber and made into .50 hank roving. The settings of the rolls at the slubber for this length of staple should be as follows: Front roll to middle, 1½ inches; middle roll to back, 2 inches. The cotton is then passed through

ONE PROCESS OF FLY FRAMES

and made into 2 hank roving. The roving for warp yarn is taken to the spinning room and made into 10s yarn. The following particulars are used on the warp frame: Gauge of spindle,3 in.; diameter of ring, 2 inches; length of traverse, 7 inches; speed of spindles, 8,600 revolutions per minute. The roving for the filling yarn may be either mule spun or, as is generally the case, ring spun.

When ring spun, use the following particulars for filling frame spinning: 10s yarn, gauge of spindle, 2¾ inches; diameter of ring, 1⅝ inches; length of traverse, 7 inches (because the filling yarn for this fabric has sufficient twist put in to stand this length of traverse), speed of spindles, 6,400 revolutions per minute. The warp yarn is then spooled, warped and run through a slasher.

Dyeing Particulars.

The fabric is dyed on the jig machine.

BLACK.

15 per cent immedial black N N, 15 per cent sulphide sodium, 3 per cent soda ash, 30 per cent Glauber's salt; rinse well, and give a soap bath.

BLUE.

5 per cent immedial indone B, 5 per cent sulphide sodium, 2 per cent soda ash, 25 per cent Glauber's salt; rinse and top with 8 ounces methylene blue B, 1 pint acetic acid.

BROWN.

6 per cent immedial brown B, 4 per

cent immedial yellow D, 10 per cent sulphide sodium, 3 per cent soda ash, 30 per cent Glauber's salt; rinse and give a soap bath.

GREEN.

4 per cent immedial yellow D, 3 per cent immedial indone B, 7 per cent sulphide sodium, 3 per cent soda ash, 30 per cent Glauber's salt; rinse and give a soap bath.

BATISTE.

Batiste as the name implies, is of French origin, commercially understood to mean a light translucent cloth, made from a fine quality of combed cotton yarn, ranging in width from 32 inches to 45 inches.

There is likewise a gradual variation in qualities, ranging from a comparatively coarse to a very fine fabric.

The variations of the different qualities will be more apparent when we consider their commercial value. It may be of interest to our readers to note the retail prices.

Cotton batiste retails at from 12½ cents in 32-inch widths to 50 cents in 45-inch width per yard.

The variety of qualities will suggest some idea of the utility of the fabric. Its uses are even more varied than are the qualities.

The finer grades of batiste are used for dress goods, all kinds of lingerie for summer wear, pillow shams, etc., while the cheaper grades are extensively used for linings in washable and unwashable shirtwaists.

In this article we are confining ourselves to bleached cotton batiste, reserving the linen and colored for some future discussion.

Batiste is woven in the gray, that is, with yarn direct from the spinning frame, with the exception that the warp yarn is well sized, in order to better stand the strain to which the yarn is subjected during the weaving process.

We will consider, first, a very fine bleached cotton batiste, of a quality made 45 inches in width, and then a very cheap grade of bleached cotton batiste, made 32 inches in width.

The analysis will readily show the vast difference in these two qualities.

FINE BLEACHED COTTON BATISTE

Width of warp in reed, 47.8 inches; finish at 45 inches; ends per inch in the cloth from loom, 94; ends per inch finished, 100; ends in warp, 4,500.

Take-up of warp during weaving, 10 per cent; weight of fabric per yard from loom, 1.15 ounces; finished weight, 1.4 ounces.

The difference in weight between fabric from loom and finished fabric is about 20 per cent, the finished goods having taken on 20 per cent of sizing material.

For adding weight to cloth, China clay is used. The proportions to use depend on the character of finish desired. China clay produces a gritty feel, which, however, may be overcome by the use of chloride of magnesium, which is a very powerful softener as well as a weighting material.

Warping plan: body of warp, 1-120s combed Sea Island cotton, selvage 2-100s cotton.

Filling plan: 98 picks of 1-200s combed Sea Island cotton.

CHEAP-GRADE COTTON BATISTE.

Width of warp in reed, 34 inches. Finish at 32 inches; ends per inch in cloth in the loom, 54; ends per inch finished, 58; ends in warp, 1,860; 54x1 reed.

Take-up of warp during weaving, 8 per cent; weight of fabric per yard from loom, .84 ounce; finished weight per yard, 1 ounce; 19 per cent increase in weight.

Warping plan: all 1-60s combed Sea Island cotton

Filling: 50 picks per inch 1-100s combed Sea Island cotton.

LOOM REQUIRED.

Batiste could be very profitably woven on a Northrop magazine loom. The fabric is a plain weave, no dobby being required. The fineness of the yarn, however, requires the use of string heddles. Wire heddles would cause too many warp breakages. The high running speed of the Northrop loom, together with the number of looms a weaver can tend,10 to 20 looms, brings the weaving cost to a minimum. The warp should be drawn in on four harnesses, skip draw as follows: 1, 3, 2, 4 instead of straight, as 1, 2, 3, 4. Skip draws give less strain to the warp.

FINISH.

Batistes are given a Swiss finish; after the cloth comes from the loom it is bleached. After the bleaching process it is sized, then sprinkled or dampened, and then calendered, after which it is folded; then it is ready for the market.

Carding and Spinning Particulars.

The division of mills which make "batiste" is the third of those mills which are equipped with machinery for making fine count yarns. Batiste is made up of extra fine counts of yarn, although these counts vary a great deal according to the grade of fabric wanted. In order to do this cloth justice it will be better to first describe the processes of a coarse yarn batiste and then a batiste made up of fine yarns. We will consider the coarse fabric to be made up of 1-60s warp yarn and 1-100s filling yarn. The finer grade we will consider made up of 1-120s warp yarn and 1-200s filling yarn.

THE RAW STOCK

used for both grades should be Sea Island cotton of from 1¾ to 2 inches staple, although 1¾ inches staple is the length generally used. The selection of the cotton is one of the first and by many considered the most important points to look out for. The lot should be sampled bale by bale and all those bales having a staple not up to standard should be thrown out of the mixing. Those bales that are selected as O. K., should be placed around the mixing bin and thrown into it alternately from each bale until all the bales for the mixing are in. At this point the

GOOD SLIVER AND PICKER WASTE

are mixed in. Care should be taken to see that the sliver waste is pulled apart into short lengths and that no other waste is thrown into the bins by mistake, because a small lot of short staple waste can cause a great deal of trouble later on. Some overseers use only an opener and one process of picking, others use two processes of picking with the opener. It is the general custom to use only an opener and one process of picking for these fine counts. The general instructions that have been given in regard to openers should be followed. The speed of the beater (rigid type) should be reduced so that the cotton should only receive 29 beats per minute. The weight of the lap at the front end of the picker (when one picker is used) should not exceed 30 pounds and from this range to 25 pounds.

A GOOD WEIGHT

per yard for the grade of fabric under description is 9 ounces. The machines should be carefully looked into to see that they are all kept clean and properly set. The laps are taken to the cards. At this point, as at a great many others, overseers differ as to the best means of procedure. Some use a large draft at the card and only one process of combing, and others use lower drafts and two processes of combing. In this lesson we will assume a large card draft and one process of combing for all counts of yarn in both grades of batiste. The speed of the licker should be reduced from about 350 revolutions per minute to 275 or 280 revolutions per minute. This is done by lagging the licker-in pulley. The wire fillet used on the cylinder should be No. 34 wire (American count, or 110s English count), and on the doffer and top flats No. 36 wire, or 130s English count.

THE FLATS

should be speeded up to take out as much waste as possible. The cards should be stripped three times a day and ground so as to keep the wire sharp. The settings used should be very close and care should be taken to see that the cotton is not broken in staple at the card. A great many times, if the cotton is sampled at the front of the card, it will be found to be shorter than when entering. This may be and is generally caused by an improper setting of the feed plate to the licker-in. While this applies directly to long staple cotton, still all cottons should be looked into carefully to avoid shortening the length of the staple. It is very important to keep the cards clean so that as little dust and dirt will go into the sliver as possible, because, if this dirt gets past the combers, it will show up in the cloth, as the thread or yarn is so small. The

PRODUCTION FOR A CARD

making this class of goods should not exceed 275 pounds per week, the weight of the sliver being about 30 to 35 grains per yard. The draft for this class of goods should not be less than 150. The card sliver is taken to the comber room and doubled 14 into 1 at the sliver lap, and the laps from this machine are taken to the ribbon lap machine and doubled 5 into 1. The weight of a yard of lap at the front of the ribbon lap machine should be about 160 grains. These laps are put up at the comber and doubled 6 into 1. The speed of the comber for this stock should not exceed 180 nips per minute. For this weight of web a double row of teeth in the top comb would give

THE BEST RESULTS.

Care should be taken to see that all needles in the top are straight and that the comber is absolutely free from dirt at all times. The table of

the comber should be gone over twice a day with whitening so that the sliver being drawn over it will not stick. The percentage of waste taken out should be about 25. These processes will answer for all the counts except for the 200s, which should be double combed, i. e., after being put through the combers once should be run through the sliver lap machine and then through the combers again. After passing through the combers the sliver passes through two processes of drawing. At these machines the sliver is doubled six into one, the speed of the front rolls at each frame being 320 revolutions per minute. Be sure the settings are proper for the staple so as not to "break" the staple, or too far apart so that uneven drawing will result.

THE TOP ROLLS

should be of a little larger diameter than for shorter length of staple; the grade of skin used for the top rolls should be finer than that used for the shorter and lower grades of cotton. Not only is this true in regard to the drawing frames, but also on all machines on which leather top rolls are used. Always keep these rolls in the best of shape and clean machines more often than with the lower grades of raw stock. The weight of sliver at the front is 60 grains per yard. The drawing sliver is put through the slubber, which makes it into .80 hank. This machine also uses a larger diameter top roll than is used on the lower grades. The slubber roving for 60s yarn is put through three processes of fly frames, the hank roving at the 1st intermediate being 2.25; at the second, 5 hank, and at the fine frames 15 hank. From here it is taken to the ring spinning room and made into 60s warp yarn on a frame having the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1 5-16 inches; length of traverse, 5 inches.

TO MAKE 100s YARN

the slubber roving is the same, also the hank roving at the first and second intermediates. The hank roving at the fine frame is 20. This yarn for filling is taken to the mule spinning room; for warp yarn used in the finer grade of batiste is sometimes spun in the mule room and sometimes in the ring spinning room. When spun on the ring frame, use the following particulars for a warp frame: Gauge of frame, 2¾ inches; diameter of ring, 1¼ inches; length of traverse, 5 inches. For making 200s yarn the final yarn is spun single at the mule; if spun double, the frames and hank roving at each would be as follows: Slubber, .80; first intermediate, 2.25; second intermediate, 5; roving, 20, and jack 30 hank. This would be taken to the mule room and spun into 200s yarn. The warp yarn for both grades of fabric would be spooled and warped and run through a slasher.

A GOOD MIXING

for 60s yarn is as follows: Water, 100 gallons; potato starch, 54 pounds; Yorkshire gum, 2 pounds; soap, 1½ pounds. A good sizing mixture for the 100s would be as follows: Water, 100 gallons; potato starch, 70 pounds; tallow, 7 pounds; Yorkshire gum, 3 pounds; soap, 2 pounds. Boil two hours and let stand 10 hours before using; keep agitator running and keep size almost at boiling point. For selvedge, the 100s yarn would have to be doubled into 2-ply 100s in addition to the other processes.

Bleaching, Dyeing and Finishing Particulars.

These goods are bleached in the ordinary way, great care being taken to keep the goods from damage.

The pieces are boiled in caustic soda at 4 degrees Tw. for ten hours, rinsed well in water, and boiled again with 4 degrees Tw. caustic soda, rinsed, and soured with ¼ degree Tw. of oil of vitriol, rinsed and passed through a solution of chloride of lime at ½ degree Tw. soured with ½ degree Tw. oil of vitriol, and well rinsed, until all acid is washed out.

The goods are then dried, and starched through a mangle with 8-12 ounces best white German dextrine to one gallon of water, starch to be well boiled one hour before using.

The pieces are dried on a tenter frame at full width, care being taken to keep the warp and filling straight.

COLORS.

If colors are required they are light blues, pinks and other light tints dyed in the mangle or on the jig.

LIGHT PINK.

For 10 50-yard pieces, 12 gallons water; ½ ounce to 2 ounces Erika pink; 20 pounds Glauber's; 3 pounds sal soda.

LIGHT BLUE.

Dye as pink with ½ to 1 ounce tetrazo brilliant blue 6B.

LIGHT SLATE.

2 ounces diamine black B H, dye as pink.

RED.

1-2 pounds benzo fast red 4B, dye as pink.

YELLOW.

Dye as pink. 8 ounces chrysophenine.

ORANGE.

Dye as pink. 1 pound Mikado orange B.

SCARLET.

Dye as pink. 1 pound diamine scarlet B.

LIGHT WINE.

Dye as pink. 1 pound diamine Bordeaux B.

LIGHT AMBER BROWN.

4 ounces diamine catechine G; 4 ounces diamine fast yellow B, dye as pink.

TOBACCO BROWN.

½ pound diamine brown B; 2 ounces diamine fast yellow B, dye as pink.

LIGHT TAN.

Dye as pink. 4 ounces diamine bronze G; 2 ounces diamine fast yellow B.

LIGHT GREEN.

Dye as pink. 10 ounces diamine green G; 5 ounces diamine fast yellow B. Top with fresh bath; 6 ounces brilliant green G.

BLACK.

Dye on jig. 15 per cent immedial black N N; 15 per cent sulphide soda; 3 per cent soda ash; 30 per cent Glauber's salt.

ITALIAN CLOTH.

Italian cloth is a light, glossy fabric made from cotton and worsted, cotton and wool, cotton and mohair and all cotton.

We will here consider the all-cotton fabric. Italian cloth is very commonly understood to mean a satin fabric, by some known as Farmer's satin.

ITS CHIEF USE.

It is used chiefly for linings for the heavier styles of ladies' dresses, also for underskirts, or for the garment itself, instead of merely as a lining; when used for such, it is usually in solid black. It is also used for shirtwaistings, fancy pillow backs and so forth, for these purposes usually in fancy colors.

The cloth is woven "in the gray" —undyed yarns. In the finer grades the warp is sized so as to facilitate the

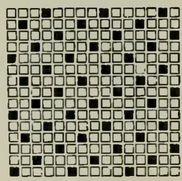


Fig. 1.

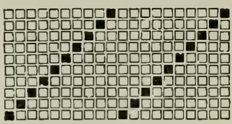


Fig. 2.

Fig. 3.

weaving process. The fabric under consideration is a five-harness satin weave. The satin weave, technically called "satin," is one of the three foundation weaves. The object of a satin weave is to get a smooth-face fabric.

In plain twill weaves every pick interlaces with the warp in the same manner, but each successive pick commences as it were one end farther to the right or left, according to the direction of the twill. This will bind the cloth in a regular order.

In satin weaves

THE INTERLACING

is arranged differently; the intersections of warp and weft are distributed as evenly as possible over the surface of the fabric.

The smallest and most common form of satin is the five-harness satin. The order of intersections is 1, 3, 5, 2, 4. (See Fig. 1.)

ANALYSIS OF FABRIC.

Width of warp in reed, 38 inches; width of fabric, finished, 36 inches; ends per inch in reed, 96; ends per inch, finished, 102; ends in warp, 3,700; 32 dent reed per inch—3 ends per dent. Take-up of warp during weaving is 5 per cent; weight of fabric, per yard, from loom, is four ounces.

Owing to the pressure the fabric is subjected to in the finishing, it stretches slightly in length; consequently the cloth should be lighter per yard, finished, than the cloth from

loom. The difference, however, is made up by the sizing materials, although it is given but a very light sizing.

The cloth per yard finished is practically of the same weight as the cloth per yard from loom.

Warp: All 1-40s cotton, left twist.

Filling: All 1-45s cotton, left twist.

130 picks per inch.

Fig. 1 shows three repeats of the design; the weave as mentioned above is a five-harness satin, weft face, with the direction of the twill running to the right.

The fabric in question has a very smooth face, which is due in a great measure to the direction of the twill being opposite to the direction of twist of yarn.

Fig. 2 shows drawing-in draft. The warp is drawn on ten harnesses, straight draw—five harnesses would be enough; ten harnesses are used so as not to overcrowd the heddles.

Fig. 3 shows reeding plan.

The warp is reeded 3 ends in one dent.

LOOM REQUIRED.

This character of fabric could be woven on any loom where ten harnesses could be operated without difficulty. The loom should have a fairly high running speed.

FINISH.

This fabric, as before mentioned, is woven with undyed yarns. After it comes from the loom it is boiled off, then dyed,after which it is subjected to a light sizing. For a light sizing it is not necessary to use anything but wheat flour, farina and a small quantity of softening material, usually tallow or wax.

After the cloth is sized it is run through the calender with the rolls well heated, the glossy face of the fabric being obtained by the heated rolls. The cloth, after the calendering,is folded, after which it is ready for the market.

Carding and Spinning Particulars.

Italian cloth is made in mills of the second division as given in a previous lesson. The class of cloth may be made up of several grades and lengths of raw stock, but for this article we will consider that the cotton is of a fair grade, the staple being about 1⅜ inches in length. The cotton is all sampled before being put through this bale breaker, several bales being placed around this machine, the cotton being fed alternately from each bale until all the cotton is gone. The bagging which covers these bales is thrown into a pile and is again picked over in order to clean all the fibre from the bagging. This is generally done by the yard hands on rainy days.

THE BEST METHOD

of conveying the cotton to the mixing bins is by a blower and endless lattices. When a blower is used, the cotton arrives at the mixing bins in a more open state and works up much better. At the mixing bin the good waste cotton from all the machines up to the slubber is mixed in. The cotton is fed to the hopper of the opener which should always be kept half full and from here is passed on to the feed rolls of the breaker picker. For this class of goods some overseers use two and some use three processes of picking. It is the general plan of up-to-date mills to use two processes with an opener. After passing the feed rolls of the breaker picker the cotton comes under the

ACTION OF THE BEATER.

If this is of a rigid two-bladed type (which is the one most generally used) the speed should be about 1,500 revolutions per minute. The total weight of the lap at the front of the breaker picker is 40 pounds or about 16 ounces to the yard. These laps are taken and put up at the finisher picker and doubled four into one. The roving waste is mixed in at this point in the proportion of three laps of good cotton to one lap of bobbin or roving waste. The roving waste is put through a special picker that takes out the twist and delivers it in a light, fluffy state. This is taken and spread evenly on the apron of a picker and made into a lap, the weight of which corresponds to the weight of the laps of the same kind being put up at the back of the finisher picker. The speed of the beater (two-bladed rigid type) for this class of work is about 1,400 revolutions per minute. This gives the cotton passing through 42 beats per inch. The total

WEIGHT OF THE LAP

at the front of the finisher should be about 35 pounds, a variation of ½ pound being allowed from standard. If the weight is more than ½ pound, the laps should be run over again, i. e., placed at the back of the finisher and run through with three other laps. If there is a great variation in the laps, the machine should be looked into to see what is the cause. For slight va-

riations in weight there are adjustments to quickly remedy the defects. The lap at the front for this class of goods should weigh 12½ ounces to the yard. The laps are put up at the card and the draft of this machine should not be less than 100. Medium card fillet wire should be used on both the cylinder, doffer and flats, the wire on the doffer and flats being one point finer than that used on the cylinder. The speed of the cylinder should be about 165 revolutions per minute; speed of licker-in, about 350 revolutions per minute; the speed of the top flats, 1 complete revolution every 50 minutes.

THE CARDS

should be stripped 3 times a day and ground surely once a month. At the time of grinding, the card wires should be all straightened out and all reset properly. Light grinding should always be used. The weight of the sliver at the front should be about 65 grains per yard. The production for a week of 60 hours (allowing 10 per cent of time for cleaning, stoppage, etc.) is about 700 pounds. The cotton sliver is then passed on to the drawing frames and through three processes of these machines. The drawing frames may be either equipped with metallic or leather covered top rolls, the speed of the front roll at each process being about 400 revolutions per minute. See that the drawing frame bottom rolls are properly set, a good setting for this stock being as follows: From centre of front roll to centre of second roll, 1½ inches; second roll to third roll. 1⅝ inches; third roll to back roll, 1⅞ inches.

The weight of sliver at the front of the finisher drawing frame should be 72 grains, the doubling at each process being six into one.

AT THE SLUBBER

the sliver is drawn into .50 hank roving. From here it passes through three processes of flyframes, the hank roving being as follows: First intermediate, 1.50 hank; second intermediate, 4.00, and fine frame 10.00 hank. At the fly frame look out for the top leather covered rolls. These should always be in the best of shape. Put just enough twist into the roving so that it will not break back at the succeeding process. Remember, every extra turn of twist given the roving lessens the production. On the other hand, do not get the roving too slack twisted, for then loss of production, as well as poor work, will result in consequence of the roving breaking back. The warp roving is then taken to

THE SPINNING ROOM

and spun into 40s yarn on a frame having the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1⅝ inches; length of traverse, 6½ inches; speed of spindle, 10,000 revolutions per minute. The roving for the filling yarn may be taken to either the ring spinning or the mule room, where it is spun into 45s yarn. If taken to the ring spinning room, use a frame of following particulars: Gauge of rame, 2¾ inches; diameter of ring, 1⅜ inches; length of traverse, 5½ inches; speed of spindles, 8,800 revolutions per minute. The warp yarn is then spooled and warped and run through a slasher.

Dyeing Particulars.

The pieces are boiled out for dark shades, and bleached white for light shades and tints.

The dyeing is done on a jig machine.

PINK.

8 ounces diamine rose G D, 20 pounds Glauber's, 1 pound sal soda. All the dyeings are for 10-12 gallons water and 10 pieces, 50 yards.

SALMON.

4 ounces diamine orange B, 1 ounce diamine scarlet B, 15 pounds Glauber's, 1 pound sal soda.

LIGHT BUFF.

4 ounces diamine catechine G, 1 ounce diamine fast yellow B, 15 pounds Glauber's, 1 pound sal soda.

LIGHT SLATE.

4 ounces diamine black B H, 15 pounds Glauber's, 1 pound sal soda.

LIGHT GRAY.

One-half pound diamine gray G, 15 pounds Glauber's, 1 pound sal soda.

LIGHT BROWN.

One-half pound diamine catechine G, ½ pound diamine brown B, 2 ounces diamine fast yellow A, 20 pounds Glauber's, 1 pound sal soda.

RED.

3 pounds diamine fast red F, 30 pounds Glauber's, 2 pounds sal soda.

SKY BLUE.

2 pounds diamine sky blue F F, 30 pounds Glauber's, 2 pounds sal soda.

SLATE.

1 pound immedial black N B, 4 ounces immedial olive B, 1 pound sulphide of sodium, 20 pounds Glauber's, ½ pound soda ash.

PEARL.

2 ounces immedial black N R T, ½ pound sulphide sodium, 10 pounds Glauber's, 6 ounces soda ash.

BLACK.

15 pounds immedial black N N, 15 pounds sulphide sodium, 30 pounds Glauber's, 3 pounds sal soda.

NAVY BLUE.

2 pounds immedial indone 3B, 2 pounds immedial indone R, 5 pounds sulphide sodium, 30 pounds Glauber's, 3 pounds sal soda.

NIGHT GREEN.

3 pounds brilliant benzo green B, 30 pounds Glauber's, 3 pounds sal soda.

HELIOTROPE.

1 pound heliotrope B B, 25 pounds Glauber's, 2 pounds sal soda.

WINE.

3 pounds tetrazo corinth G, 30 pounds Glauber's, 3 pounds sal soda.

OLD GOLD.

2 pounds diamine fast yellow A, 1¼ pounds diamine brown 3G, 30 pounds Glauber's, 3 pounds sal soda.

FINISHING.

Cotton Italians are finished with a calender finish, passed through a cotton rolled calender, to get a good finish, and then softened down, with a light beetling on a beetling machine, or finished altogether on a beetling machine.

They are also given a hot press finish on the hydraulic press with hot press plates and papers, to imitate the worsted Italians.

Beetling Process for Finishing.

The beetling process for finishing cotton and linen piece goods is one of the oldest finishes in the bleaching and dyeing trades.

It was first invented in the linen bleacheries of the north of Ireland in the Belfast district. The first beetling machines were very crude affairs compared with the machines now in service.

The beam on which the cloth was wound was a large tree trunk turned down and smoothed, which was set in motion with a handle. The part of the machine which lifted the fallers was also turned by hand. The principle of a finish by a beetling machine is simply an improvement on the old mangle, to smooth the cloth, and fill in the spaces between the threads, making the cloth more opaque, and showing the ordinary linen finish. A good beetle finish is also a permanent finish and will stand sponging and ironing.

THE NEW BEETLES

are made entirely of iron, except the fallers, which are wooden. The cloth is wound on the iron cylinder or beam, which revolves about 40 times a minute; the fallers are lifted by cams and fall of their own weight, about 16 inches on the cloth, from 40 to 50 times a minute. The cloth receives by this process a tremendous hammering, and where 10 or more machines are together the noise is simply deafening.

Goods made of half linen and half cotton can be finished to look like all linen goods, and in some goods made of all cotton the finish makes the pieces exactly like a piece of linen, and even

AN EXPERT MAY BE DECEIVED

thereby. Some goods are heavily starched and dryed, then sprinkled, put on the beetles, and hammered for four or five days, being sprinkled and turned occasionally. The beetles are run night and day with two crews. In Ireland, where labor is cheap and water power is used, the finish is not very expensive, although the process is very long, as the goods are often on the beetles for six days. Where steam power only is used, the finish is almost prohibitory and as a very large and expensive plant is required to turn out a large amount of goods, not many plants of any great capacity have been erected in this country.

The largest beetling works are those of the Macnab Co., Hurlet, Paisley, Scotland. There are about 100 sections of beetles there, and some very fine work is turned out.

A GOOD FINISH

is obtained on silesias by first passing the goods through a calender and then giving a few hours on the beetle. Mather and Platt, of Manchester, have a patent beetle with spring hammers instead of fallers. This machine is said to be good for some finishes, but many prefer the old wooden faller machine. Any width of cloth can be finished on the beetle. Holland shades of over 100 inches in width are handled with ease, and the width of the cloth is always increased during the process of beetle finish.

CHEESECLOTH.

This is a thin cotton fabric of light weight and low counts of yarn, which for cheapness ranks among the first in cotton fabrics.

The fact that it is a cheap fabric has much to do with its popularity, in so far that it is used for inuumerable purposes; chief among which we may mention that it is used for wrapping cheeses and butter after they are pressed, for these purposes only the bleached fabric being used. It is also much in demand for bunting for festal occasions, for light curtains, masquerade dresses, etc. When used for buntings, draperies and the like, it is usually in colors. Red, blue, cream and yellow bunting seem to have the greatest demand.

In the sample which will now be considered, the cheesecloth is of a fair quality; the weave is a one and one, or plain weave; there is very little variety in the designing.

THE CHIEF OBJECT

of the designer in constructing a fabric of this character is to find the least number of ends and picks per inch required, so that the fabric will not slip too easily; that is, if the cloth is taken between the thumb and first finger of each hand, and the thumbs drawn away from each other over the surface of the fabric and first fingers, the ends, if pulling in the direction of the filling, will not leave their proper places too easily, or, if pulling in the direction of the warp, the picks or filling will not give too easily.

This tendency to slip is entirely due to the lack of material necessary to produce a perfect or firm cloth.

A PERFECT CLOTH

may be defined as a cloth in which the warp or weft yarns are equal in diameter and the spaces between the threads are equal to the diameter of the yarn.

For instance, let us construct a perfect cloth with 1-36s cotton yarn for both warp and filling. By squaring the counts we find the diameter of yarn to be 1-165th part of an inch; that is, 165 threads of 1-36s will lie side by side in one inch, and by subtracting one-half of the 165 to allow for the space required for the interlacing with the weft we have 82 ends and 82 picks necessary for one inch of cloth.

In the sample in question there is only about half the number necessary to make perfect or firm cloth.

ANALYSIS OF FABRIC.

Width of warp in reed, 38 inches; width of fabric finished, 36 inches.

Ends per inch in reed, 42; ends per inch in finished cloth, 45.

Picks per inch in loom, 42; picks per inch, finished, 42; ends in warp, 1,620.

Reed, 750x2.

Take-up of warp during weaving, 6 per cent; weight of cloth, per yard, from loom, 1.7 ounces; finished weight per yard, practically the same.

Warp, all 1-36s cotton carded peeler; filling, all 1-36s cotton carded peeler.

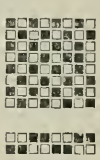


Fig 1.

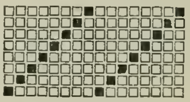


Fig 2.

Fig. 1, design.

Fig. 2, drawing-in draft.

LOOM REQUIRED.

The retail price of cheesecloth, 5c. to 8c. per yard, requires that it be woven on a high running speed loom. The Northrop loom would be about the best, running at about 200 picks per minute. If the warps are properly sized a weaver can take care of 10 to 16 looms.

FINISH.

Cheesecloth is given very little finish. After it comes from the loom, it passes to the dyehouse, where it is bleached or dyed as the case may be; the cloth is dyed in a gig dyeing machine. After the dyeing it is passed through a rotary press with cylinder slightly heated, after which it is folded and is then ready for the market.

Carding and Spinning Particulars.

The yarns of which cheesecloth are made up would be made in mills having an equipment of machinery for making coarse or medium grade yarns. There are several kinds and grades of cotton used for the manufacture of this cloth and the count of yarn varies, but not to such a variation as has been the case with the cloths that have been described in late articles. For this article it will be considered that the cotton is made up of a medium grade of cotton of 1¼ inches length of staple and that the count of the yarn for both warp and filling is 36s. The cotton is fed

to the bale breaker (if the mill contains one) or the bales are placed around the mixing bin and mixed by hand.

THE HAND MIXING

does not give as uniform a mixing as the bale breaker, and when the mixing is done by hand it ought to stand longer before being used, so that it will dry out thoroughly. For this class of goods three processes of picking and an opener are used. The good waste cotton is mixed direct into the bin with the raw stock as it is collected. The cotton is then fed to the opener, which is generally supplied with a porcupine opener, and this should revolve at about 1,050 revolutions per minute. From the opener the cotton is conveyed by an endless apron to feed rolls of the breaker picker, which condense the fluffy mass into a sheet and offer it to the beater. The beater of this machine and also of the intermediate and finisher pickers is generally of the rigid, two-bladed type. The breaker picker makes 1,500 revolutions per minute, the total weight of the lap at the front being 40 pounds, or 16 ounces per yard. These laps are put up at the intermediate picker and

DOUBLED FOUR INTO ONE.

The beater of this machine should make about 1,450 revolutions per minute, the total weight of a lap at the front being 37 pounds, or 12 ounces to the yard. The laps are put up at the finisher picker and doubled four into one, the beater making 1,450 revolutions per minute, and the total weight of the lap at the front end being 35 pounds or 12½ ounces to yard of lap. Keep the draught of the pickers on the top cage as this will help to prevent splitting of laps; also see that the fly is not allowed to accumulate to any great extent under the machines. There should always be a supply of laps ahead, in case of a breakdown. Always use old laps first and not the newly made ones. The laps are carried to the card. The draught of this machine for this class of work should not exceed 100. The top flats should make one complete revolution every 50 minutes. Cards should be set for coarse work, using No. 33 wire on cylinder fillet, and No. 34 wire on doffer and top flats. Use a 26 or 27 inch diameter doffer.

THE SLIVER

should weigh 65 grains per yard, and the production for a week of 60 hours should be 750 pounds. The sliver is put through three processes of drawing. It would be of great advantage to use metallic rolls. The doublings at each process are six into one. The drawing sliver is put through the slubber and made into .50 hank roving. This roving passes through two processes of fly frames. At the first intermediate the hank roving is 1.56, at the second intermediate this is made into 3.75 hank, and at the fly frame 7.50. At the fly frame watch the leather top rolls. The bottom steel rolls should be taken out and scoured at least once a year. The hank roving is then taken to the ring spinning room or the roving for the filling may be taken to the mule room and made into 36s yarn. If taken to

THE SPINNING ROOM,

use a frame having the following particulars (for 36s filling): Gauge of frame, 2¾ inches; diameter of ring, 1⅝ inches; length of traverse, 6½ inches; speed of spindles, 10,200 revolutions per minute. For warp yarns (36s), use 2¾ inches gauge of frame; 1⅜ inches diameter of ring, and 5½ inches length of traverse, with spindles running at 8,900 revolutions per minute. The warp yarn is then spooled, warped and run through a slasher.

Dyeing Particulars.

Cheesecloth is dyed on the gig machine, or in the starch mangle during the starching process.

PINK.

For 10 gallons liquor, 3 pounds 8 ounces cornstarch or dextrine. 4-6 ounces Erika pink, 2 pounds Glauber's, 1 pound sal soda.

YELLOW.

As pink; 1 pound chrysophenine.

ROYAL BLUE.

As pink; 2 pounds alum, no sal soda, 1 pound Victoria blue B.

SCARLET.

As pink; 2 pounds diamine scarlet B.

RED.

As pink; 3 pounds benzo purpurine 4B.

LIGHT SLATE.

As pink; 8 ounces diamine black B H, 1 ounce diamine fast yellow B.

BROWN.

As pink; 2 pounds benzo fast orange S, 2 pounds chrysophenine, ½ pound benzo fast black.

HELIOTROPE.

As pink; 1 pound benzo fast violet R, 4 ounces benzo fast blue B N.

VELVETEEN.

Velveteens, also termed fustians and velverets, are heavy cotton fabrics in which the distinguishing effect is formed by the points of the fibres in the filling yarns, termed the pile, being presented to the vision, and not

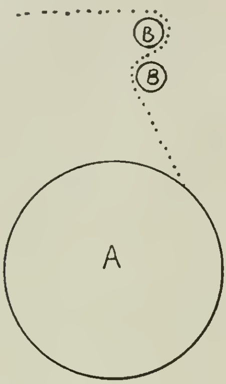


FIG. 1.

the sides of the yarns as in the majority of fabrics.

They are principally used for dress and hat trimmings, suitings, and upholstery, having exceptional wearing qualities and showing a full, deep color.

Corduroys are sometimes termed velveteens, the same principle of construction being adopted in both fabrics, but a corduroy is distinguished by having a corded stripe effect running lengthways of the piece, the dividing line between each stripe showing both warp and filling.

In the simplest type of velveteens the pile filling, after being cut, hides the warp entirely from the face. To accomplish this the goods are made with a comparatively small number of ends and large number of picks per inch, ranging from 50 to 76 ends and 150 to 600 picks. One warp only is used.

A fairly heavy loom is necessary.

Figures 1 and 2 illustrate two methods of arranging the whip rolls and yarn when weaving some of the heavier picked goods. In each figure A

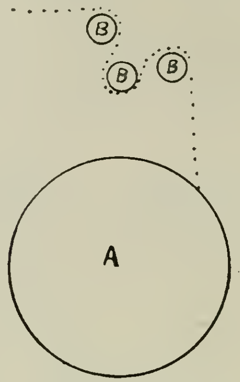


FIG. 2

represents the warp beam and B the whip rolls. The dotted line indicates the direction of the yarn.

Standard widths for velveteens are 19 inches, 22½ inches, 24½ inches and 27½ inches or 28 inches. For the latter width the warp is spread about 33½ inches in the loom. The weights for 28-inch goods vary from one to three and one-half yards per pound.

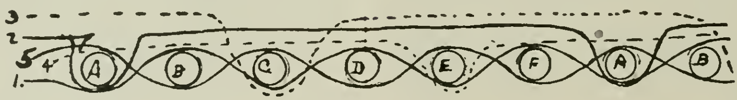


FIG. 4.

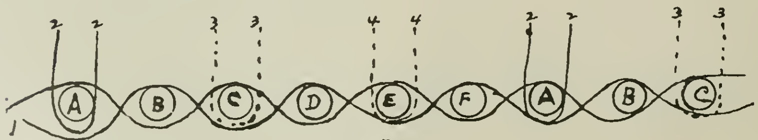


FIG. 5

The goods are usually woven two or more widths in the loom, with split selvedges.

In order that the fabric may remain firm after the pile picks are cut, ground or binder picks are inserted regularly, working either plain or twill as may be desired. The filling for

these picks is similar to that used for the pile, only one shuttle being used.

Figure 3 is a design for a velveteen, arranged one ground and three pile picks, the ground weave being plain. The drawing-in draft is straight on 6 harnesses, 1 to 6. The selvedges are woven with a selvedge motion.

The ends are reeded 2 in each dent.

The chain draft is similar to the weave, Fig. 3.

Six ends and eight picks repeat.

Figure 4 shows a sectional view of the cloth before being cut. Figure 5 shows the same with the pile cut. Lettered circles in these figures correspond to ends, and numbered lines to picks, in Figure 3.

An analysis of two fabrics woven with design, Figure 3, shows the following:

Sample No. 1: 76 ends and 192 picks per inch; 28s warp and 40s filling; width 23 inches; weight 4.35 yards per pound.

This is a velveteen of poor quality.

Sample No. 2 is of a good quality. It contains 76 ends and 375 picks per

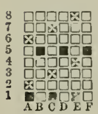


Fig. 3.

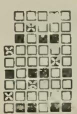


Fig. 6.

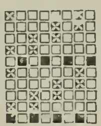


Fig. 7.

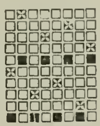


Fig. 8.

inch, 2-ply 60s warp and 55s filling, and the weight is 3.35 yards per pound.

Some velveteens are sold by weight, similar to men's wear fabrics, so many ounces per yard.

Another standard fabric woven with design Figure 3 is as follows: 74 ends, 260 picks, 2-ply 70s warp, 60s filling.

Figure 6 shows a design with a 3-end twill ground, arranged one ground and three pile picks. The drawing-in draft is straight, reed draft, 2 ends per dent, chain draft same as weave, repeated to 18 picks. Selvedges extra.

Figure 7 shows a design for what is termed a fast back velveteen, arranged one ground and four pile picks. When each pile pick is tied under two ends, as in this example, the effect is not so good as when tied only once, but the wearing qualities are improved.

In the preceding examples it will be seen that the pile filling is bound only on every other end.

Figure 8 illustrates a design in which the pile is bound in on every end. This type makes a firm texture but does not admit of a large number of picks, therefore the pile cannot be made very full.

PURPOSES.

For dress and trimming purposes velveteens are usually of a solid color, being piece dyed.

For upholstery purposes the goods are dyed, printed, embossed or stamped. Panel and stripe patterns are also made by cutting a raised figure on an uncut ground, or vice versa, by painting or by the pyrogravure process, burning.

When

STAMPING

velveteens the goods are passed between two cylinders. The upper cylinder is of iron and is heated from the inside. The pattern is engraved or sunk into this. The lower cylinder is of hard wood. The pile is compressed by the projecting part of the upper cylinder, causing the pattern to stand out in relief from a dull ground, or vice versa.

PAINTING ON VELVETEENS

is essentially a hand process. The colors have to be free from oil that they may not spread beyond the limits intended.

In the pyrogravure process of making patterns on velveteens, the sketch is first made and placed in a pantograph machine. With a platinum stylus heated to redness the operator then burns out the pile along the lines traced, leaving a very clear pattern.

From the time a velveteen leaves the loom to the time it is ready for cutting, it has to be passed through several processes. It is first put through a

BACK STARCHING AND DRYING MACHINE.

After drying, the better grades are raised on the under side to make a softer feeling cloth. The lower qualities are not raised on account of the tendency for the process to weaken the cloth.

The goods are then, while under tension, saturated with a weak milk of lime, the solution being brushed into them on the face side.

The next process is drying. This is done by a device in which rods are automatically inserted below the fabric, so that the latter hangs down in loops.

After drying, the cloth is folded and passed to the brushing machine. This machine removes the lime and loosens the filling floats so that the knife can readily enter beneath them.

The cutting process proper now

takes place, being done either by machinery or by hand.

—

Carding and Spinning Particulars.

The fabric for which the carding and spinning particulars are given below is made up in several grades. For this article only two grades will be considered, a coarse one having a warp of 1-28s and 1-40s filling; and a fine grade, the warp yarn of which is 2-70s and with a filling of 2-60s yarn. This fabric, all grades, would be made either in the second or third division of mills as given in a previous lesson. We will consider

THE COARSER GRADE

first. This would be made from a medium grade 1 5-16 inch staple cotton and run through the bale breaker with blower and endless lattice connections, so that it will reach the mixing bins in a dry, open state. When feeding the bale breaker do not feed one entire lap before starting on another, but open several laps around the bale breaker and feed from each bale alternately. The mixing should be

AS LARGE AS POSSIBLE,

so that there will be less variation in the yarn than when small mixings are used. The good waste from the machines up to the slubber is mixed into the bin as it is collected. The cotton is next put through an opener and either 2 or 3 processes of pickers. It is the general custom nowadays to use 2 processes, but the particulars for three processes will be given. If one process is left out, use particulars given for breaker and finisher pickers. Feed the hopper of the opener so that it is always more than half full, because the more cotton there is in the hopper the more cotton will be taken up by the spiked apron and thus a more even sheet will be presented to the beater, which is generally of a porcupine type and is speeded up to 1,000 revolutions per minute. The speed of the beater at the breaker picker is 1,500 revolutions per minute. The total weight of laps at the front of this machine is 40 pounds or a 16-ounce lap. These laps are

DOUBLED FOUR INTO ONE

at the intermediate. At this machine the speed of the beater is 1,450 revolutions per minute. The total weight of the lap at the front is 37 pounds or a 10-ounce lap. These laps are doubled four into one at the finisher picker, the total weight of a lap at the front being 39 pounds or 14½ ounce lap. The speed of this beater is 1,450 revolutions per minute, which gives the cotton passing through it 42 blows or beats per inch. Each lap, as it is taken from the front of the finisher picker, should be weighed and all those laps ranging over a half a pound from the standard, either way (light or heavy), should be run over again. The

CUT ROVING WASTE

is mixed in at the back of the finisher picker in proportion of one lap of roving waste to three laps of raw stock. The cut roving waste has to go through a special process to take out twist and from here it is put through a picker which forms it into a lap, then it is mixed with the raw stock as above. From the picker the laps are taken to the card. The draft of this machine should be about 110. The settings should be medium and the wire fillet used would be No. 35 for doffer and flats and No. 34 for cylinder. The speed of the top flats should be one complete revolution every 40 minutes. The sliver at the front should weigh 65 grains per yard and the production for a week of 60 hours should be about 800 pounds. The sliver is then put through

THREE PROCESSES OF DRAWING,

the doublings at each process being six into one.

The speed of the front roll is 400 revolutions per minute at each process. The sliver should weigh about 70 grains per yard. This is then put through the slubber and made into .50 hank roving. The roving to be used for 28s yarn is put through two processes of fly frames, the hank roving at the first intermediate being 2 and at the second being 6. This is then taken to the ring spinning room and made into 28s yarn on a warp frame having the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1¾ inches; length of traverse, 6½ inches; speed of spindles, 9,700 revolutions per minute. From here it is passed through the spooler, which takes the yarn from the cop and winds it onto a spool. From here it is wound onto a beam and several of these beams are put up at the ends and run through the slasher and wound on to a beam at the front, which has the required number of ends required for the warp of the fabric.

THE SLUBBER ROVING

for filling yarn is put through three processes of fly frames, the hank roving 1.50 at the first intermediate. 4

hank at the second and 8 hank at the last frame. This roving for filling may be taken to either the mule room or the ring spinning room to be made into 40s. We will consider it to be taken to the ring spinning room and spun on a frame having the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1⅜ inches; length of traverse, 5½ inches.

FOR THE FINER GRADES

of velveteen the foregoing general particulars may be used, but substituting the following for 60s and 70s yarn: Use 1½ inches staple cotton; at the pickers the total weight of lap at the front is 40 pounds or 16-ounce lap at the beater and 35 pounds or 12-ounce lap at finisher, no intermediate picker being used. At the card the top flats should make one complete revolution every 40 minutes, the weight of sliver at front being 65 grains and production about 500 pounds per week.

THE DRAFT

should not be less than 120. Sometimes the filling yarn is combed, but we will consider this yarn to be carded and so it will be put through three processes of drawing. At the slubber the sliver is drawn into .55 hank roving and for both warp and filling is put through three processes of fly frames, the hank roving being as follows: To make 70s yarn: first intermediate, 1.50 hank; second, 4 hank; and jack frames, 14 hank. To make 60s yarn: first intermediate, 1.50; second, 4 hank; and fine, 12 hank. The 14 hank roving is taken and spun into 70s yarn on a

WARP SPINNING FRAME

fitted up as follows: Gauge of frame 2¾ inches; diameter of ring, 1⅜ inches; speed of spindles, 10,000 revolutions per minute; length of traverse 5½ inches. From here it is spooled, then twisted into 2-ply and spooled again, warped and put through the slasher. The 12 roving to be made into 60s yarn may be taken either to the mule room or the ring spinning room. If taken to the ring frame, use a frame having the following: Gauge of frame 2¾ inches; diameter of ring, 1¼ inches; length of traverse, 5 inches. The yarn is then twisted into 2-60s.

Dyeing Particulars.

Velveteen is dyed on the jigger machine in 15 gallons of liquor at 175 degrees F.; for 30 pounds of goods, one-half pound soda ash, one-quarter pound sulphide sodium, 1 pound salt; boil up the liquor, add the soda, sodium sulphide and salt before adding the dyestuff, strain through a piece of calico into the jigger.

The goods are run for 30 to 60 minutes; rinse well in water after dyeing.

ECRU.

4 ounces immedial bronze A, aftertreat with ½ per cent bichrome. ½ per cent sulphate copper.

LIGHT SLATE.

4 ounces immedial black V, aftertreat ½ per cent bichrome, ½ per cent sulphate copper.

PEARL.

1½ ounces immedial black V, 1½ ounces immedial brown B, aftertreat as slate.

FAWN DRAB.

12 ounces immedial bronze A, 2 ounces immedial brown B.

LIGHT BROWN.

1 pound immedial brown B, 4 ounces immedial cutch O, 1 pound sulphide sodium.

MEDIUM BROWN.

½ pound immedial yellow D, 1 pound immedial brown B, ½ pound immedial cutch O, 1½ pounds sulphide sodium.

DARK BROWN.

20 pounds salt, ½ pound soda ash, 5 pounds sulphide, ½ pound immedial black N R T sodium, 8 pounds immedial brown B.

NAVY BLUE.

Dye as ecru with 2 pounds immedial blue C, 2 pounds sodium sulphide, ½ pound soda ash, 10 pounds salt; rinse and top with methylene blue N, and shade with methyl violet B.

BLACK.

2 pounds immedial black V, 2 pounds sodium sulphide, ½ pound soda ash, 10 pounds salt; rinse and top with a one-dip black, or paint with Prussian blue.

INDIGO BLUE.

For 30 pounds goods in jigger, 1 to 5 pounds pyrogene indigo, 1 to 5 pounds sodium sulphide, 1 to 2 pounds soda ash, 5 to 15 pounds salt, ½ to 1 pint mineral oil; rinse and soap, top with methylene blue.

A large number of one dip colors are also dyed on velveteens, from light to dark shades. Although the colors are not so fast as sulphur colors, they are sufficiently fast for some trades.

After dyeing, the goods are topped with basic colors, as methyl violet with methylene blue, Bismarck brown and other bright colors.

For 30 pounds of goods, 3 pounds di-

amine green, 20 pounds salt, 1 pound sal soda; top with Malachite green.

SULPHUR GREEN,

2 pounds immedial indone B B, 1 pound immedial yellow D, 2 pounds sulphide soda, 1 pound soda ash, 10 pounds salt. Rinse and top with brilliant green or Malachite green.

VELVETEEN CUTTING.

Velveteen cutting is one of the processes incident to making cloth that is still, to a considerable extent, done by hand for practical purposes, although machines are now in constant use for accomplishing the same results.

The object of cutting is to present to the vision the points, instead of the sides, of the fibres in the filling.

Fig. 1 illustrates the type of knife used when the cutting is done by hand. The guide A is inserted in a race of the cloth, and raises the filling to the cutting edge B as it is forced along.

The cutting is generally done with the blade of the knife held in a vertical position, so as to cut the filling in the centre of the float.

A STRIPE EFFECT

is obtained, either intentionally or unintentionally, by varying the position of the knife to the left, centre or right, if two or three positions are held while cutting the same piece. Instead of cutting with the knife inclined first one way and then the other, to right and left, when making stripes with an ordinary weave, knives with two blades are sometimes used to make both cuts at once, one blade being a little shorter than the other.

There are

TWO METHODS

of cutting velveteens by hand: (a) the long-frame method; (b) the short-frame method. In both these the cloth is first stretched over rollers to a suitable tension.

In long-frame cutting, two pieces are generally arranged parallel to each other, about 10 or 12 yards long, with room enough for the cutter to pass between. The cutter cuts one race in one piece when walking in one direction and a race in the other piece when returning. Assuming that a

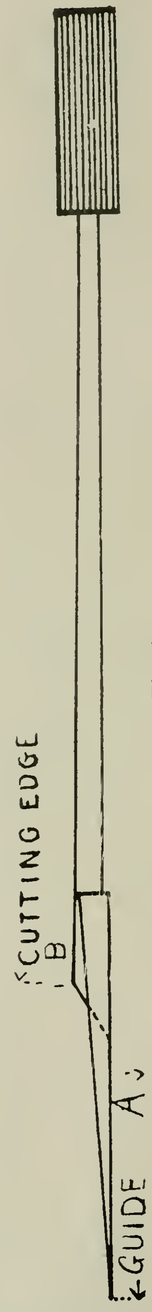


Fig. 1.

24-inch velvet with 900 races is required to be cut, the cutter will have to walk 900x10, which equals 9,000 yds.,

or over 5 miles to cut 10 yards. This illustrates how laborious the hand cutting process is.

IN SHORT-FRAME CUTTING,

about two yards of cloth are cut before a change is made. Here the cutter, with a peculiar swing of the body, forces the knife to the end of the two yards.

Considerable skill is required in a good cutter, as a wrong movement is liable to damage the piece, either by running the knife through it or by cutting at the side instead of the centre of the race.

The amount of seconds in velveteens is very large, there being many of them made after they leave the loom, as well as during the process of weaving. The least imperfection in weaving will cause trouble in cutting.

TWO KINDS OF MACHINES.

Machines for cutting velveteens are of two kinds, blade cutters, and disc or circular cutters. The blade cutters most nearly approach the results attained by hand cutting, the blades being inserted below the filling so as to force the points of the filling upwards as they are cut. The disc cutters cut the filling from the top of the cloth downwards, the resulting pile being inferior to that cut by the blades.

BLADE CUTTERS

are of two kinds, single and multiple. The former have so far given the most satisfactory results on account of the difficulty of keeping the several blades in a multiple machine in perfect alignment with each other.

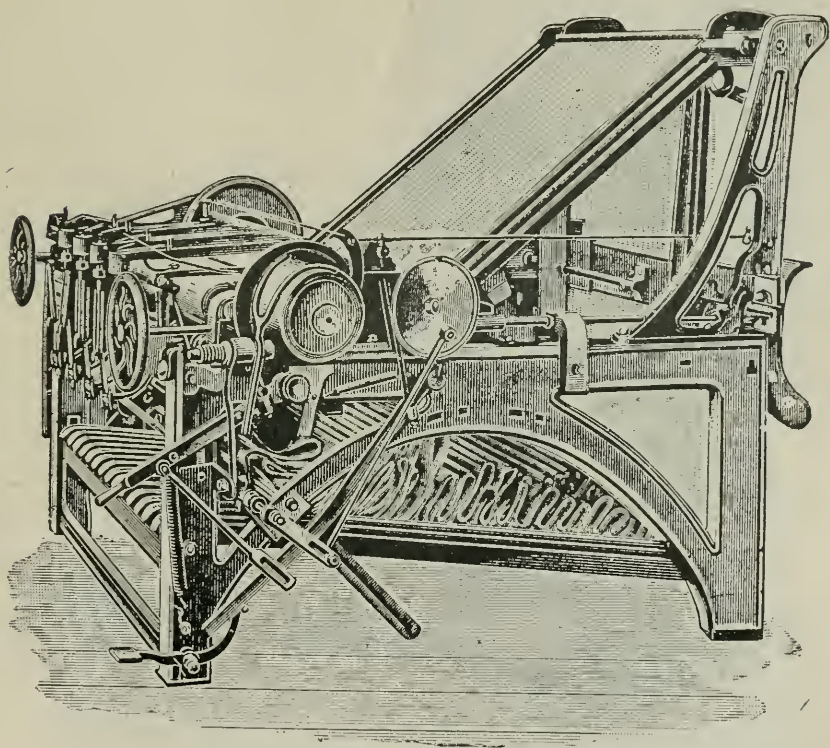


Fig. 2.

The blades are similar to those used when cutting by hand, except that they are smaller.

With a single blade one race is cut at a time, either in lengths of 12 yards or the entire piece, and it is necessary to repeat the operation for each race in the cloth. The

BLADE MACHINES PROPER

are of two kinds, those in which the knives are stationary, the full length of cloth being passed through in an

endless form, and those in which the cloth is stationary, stretched on a long table, and the knives have a horizontal movement.

Both of these types of machines are fitted with either mechanical or electrical stop motions, which cause them to stop immediately a knife jumps out

Figs. 2 and 3 illustrate a continuous cutting machine with four knives.

Cloth cut by a machine of this type is claimed to be of a superior quality, because there is no necessity to take the knives out every few yards, as is the case in hand cutting.

In addition to the regular tension de-

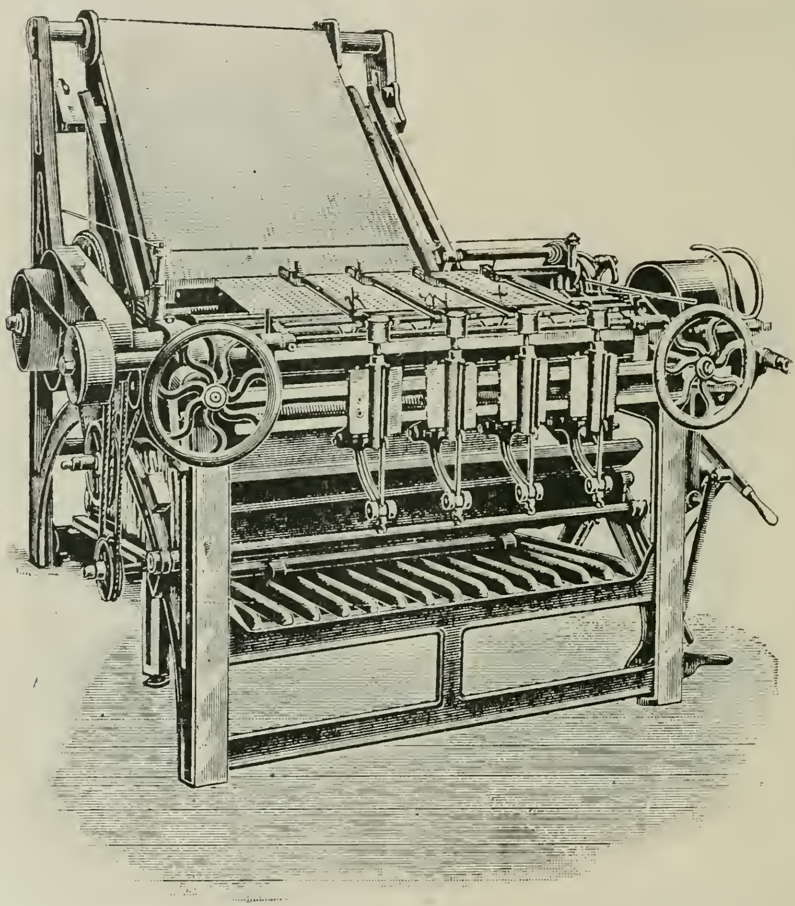


Fig. 3.

or meets with an obstruction when cutting, or when the end of the race is reached.

Machine cutters require the

CONSTANT ATTENTION

of a skilled mechanic to keep them in proper condition. If they are not kept sharp and exactly to gauge, the pile will appear stripey, due to uneven cutting.

vices for holding the piece tight, there are special plates arranged for holding and supporting the fabric immediately under the race being cut. The mechanism is so arranged that the knives, plates, etc., are all moved simultaneously, after each cut.

THE KNIVES

are mounted on hinged arms in such a manner that they lie upon the fab-

ric as it is fed forward, and so continuously cut it. The mounting of the knives is of such a character that in the event of an accident, the worst that can happen is the puncture of the fabric, but the hole so made is only a small one, as the knife is instantly released and the machine stopped.

When the end of a race is reached the knives are readjusted and another set of races cut.

The

DISC CUTTING MACHINES

are fitted with cutting discs of steel plate, accurately gauged and well-sharpened, mounted on a shaft, running at a speed of about 3,000 revolutions per minute. They are sharpened automatically, while the machine is in motion. The number of these cutters depends on the number of races to be cut.

The discs run inside small iron triangles, which serve as guides. These guides are placed in the races of the cloth by hand, and the piece is cut as it is drawn forward by the machine.

The

PRODUCTION OF A DISC CUTTER

is much greater than that of a blade cutter.

The disc machine effects quite a saving in cutting corduroys, these fabrics not having as many races as velveteens.

Devices for cutting the pile filling during the process of weaving have been tried, but have not met with success. One objection to this method is that the goods cannot be finished satisfactorily, the pile pulling out, if handled too severely.

BRILLIANTINE.

Brilliantine is a dress fabric, resembling alpaca, but of superior quality and sometimes finished on both sides. Brilliantines are made with a cotton warp and lustre worsted filling. Lustre wool is grown in Indiana and Kentucky and is commonly known in the trade as braid wool.

Lustre wools are more extensively grown in England. The best qualities are grown in Lincolnshire. The fibres of Lincolnshire lustre range from 8 to 12 inches and are about 1-800th of an inch in diameter.

The wool after it comes from the sheep is sorted both for quality and

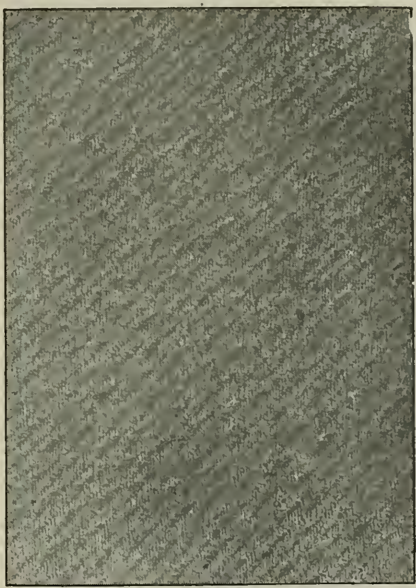


Fig. 1.

lustre and the higher the degree of lustre the more adaptable it is for fancy shades, while the dull or semi-lustre is only used for dark colors.

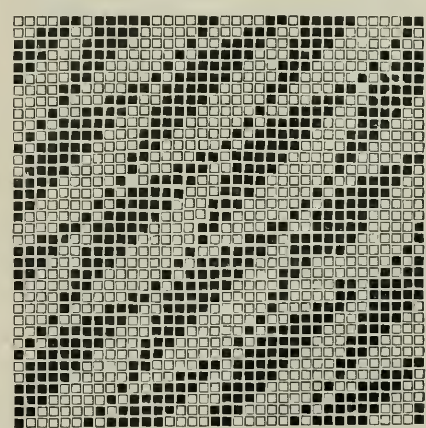


Fig. 2.

Brilliantines are sometimes woven with undyed weft yarn and very rarely if ever with undyed warp yarn. They

are commonly made with both warp and weft yarns dyed previous to weaving. The warp yarn may be the same color as weft or it may be entirely different. If, however, a one-colored fabric is desired and it is to be made with undyed weft yarn, the warp yarn must be dyed, previous to weaving, the same color as the weft will be dyed after the fabric is woven. The warp being cotton will not take color in a wool dye bath.

Fig. 1 shows sample in which both warp and weft are dyed previous to weaving. The warp is light brown and the weft is a medium shade of green. This contrast of colors in connection with the weave gives the fabric

A VERY PRETTY EFFECT.

Any combination of colors may be used. A very important factor to consider in making brilliantines is the weave. The object is to have as much weft floating on the face of fabric as warp, and in figured brilliantines the

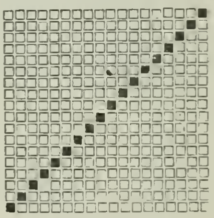


Fig. 3.

figure must in all cases be a weft floating figure. The reason for this is obvious when a lustrous fabric is desired.

The design in Fig. 2, of which two repeats are shown, both warp way and filling way, shows the filling to float on the face of the fabric in exact proportions to the float of warp.

Very pretty effects are obtained with a plain ground weave with a small jacquard figure, and when a very lustrous fabric is wanted, the warp yarn is of finer counts than weft yarn.

ANALYSIS OF FABRIC.

Width of warp in reed (without selvedge), 42½ inches; width of fabric finished, 40 inches; ends per inch in reed, 60; ends per inch finished, 64; ends in warp, 2,535—light brown; 60 ends selvedge, white (30 ends each side), equals 2,595.

Reed 30x2 equals 60 ends.

Take-up of warp during weaving 6 per cent. Weight of fabric per yard from loom 5 ounces; weight of fabric finished practically the same.

Body of warp 2-40s cotton dyed; selvedge 2-40s cotton undyed.

Brilliantines, mohairs and alpacas are usually made with different colored selvedge yarn than the body of warp.

Filling all 1-30s lustre worsted, of about a ¼ blood stock.

Fig. 3 shows drawing-in draft—drawn in on 18 harnesses straight draw, pattern repeats on 18 ends and 18 picks.

LOOM REQUIRED.

For small figured brilliantine a Knowles dobby loom would be about the best. Large figures require a jacquard loom; brilliantines usually require only one kind of filling, consequently a box loom is not necessary, but in order to keep the shade of weft as even as possible when using dyed yarn, two shuttles are sometimes used weaving "pick and pick."

FINISH.

Brilliantines made with undyed weft, after they come from the loom, are first scoured, then dyed; after which they are run through a rotary press, of which the cylinder has from 50 to 60 pounds of steam heat. Brilliantines shrink a little after they come from the loom. The pressure to which they are subjected during the finishing process stretches them out to their original length. Those made with dyed yarns are given usually a dry finish, that is, they are simply run through the press, cylinder heated, after which they are rolled, then packed.

Carding and Spinning Particulars.

In a previous article, under the heading "Carding and Spinning Particulars," the mills were subdivided into three divisions. For the benefit of readers, we will repeat how they were divided for use in these articles. Mills making low count yarns, say from 1s to 30s, were included in the first division, those making medium count yarns, or from 30 to 70s, were included in the second, and the third division comprised mills making yarns from 70s up. This does not mean that only the yarns between the counts given are made in one division, but that the greater portion of the counts of yarn made in the divisions referred to are between the counts given. The

COUNT OF COTTON YARN

used for brilliantine for this article is

2-40s. The filling yarn is lustre worsted yarn and therefore we will only deal with the cotton warp yarn. This class of yarns is made in the second division of mills, the cotton used being of a medium grade and having a staple of about 1 3-16 inches. The equipment for the second division of mills may call for a bale breaker or not. We will consider that one is included. The bales of cotton are stapled and several placed around and fed to the bale breaker alternately from each bale until all are gone. The bale breaker has a capacity of about 80,000 pounds per week of 60 hours. The cotton is carried by endless moving aprons so arranged that they may be moved so as to allow the cotton to be dropped into its proper bin. The bins should be as large as possible so as to allow

A LARGE MIXING.

At this point the sliver waste from the machines up to the slubber is mixed with the raw stock. The cut roving waste of the same length and grade of staple is not mixed at this place, but has to go through a special picking machine, which takes out the twist, then it is put through a picker and made into a lap, after which it is mixed with the raw stock, as will be shown later. The equipment for this division may include two or three processes of pickers. We will consider that it contains an opener and three processes of picking.

THE BEATER

used is generally of the porcupine pattern and the speed should be about 1,000 revolutions per minute for this class of work. The opener is generally attached to the breaker picker and after passing the beater of the opener the cotton is passed to the feed rolls by a moving endless apron. At this point the cotton is in an open, fluffy state. The feed rolls condense the cotton, as it passes between the rolls, into a sheet, and in this state it is presented to the beater of the breaker picker. This beater is generally of a rigid, two-bladed type and for the cotton in question has a speed of 1,500 revolutions per minute. The cotton is then blown on to a set of cages and compressed into a sheet, after which it passes through several sets of calender rolls between which it is further pressed. The total weight of the lap at the front is 40 pounds or about 16 ounces to the yard. These laps are put up at the back of the intermediate picker and

DOUBLED FOUR INTO ONE.

The speed of this beater is about 1,450 revolutions per minute. The total weight of the lap at the front is 37 pounds or a 10-ounce lap. These laps are put up at the finisher picker and doubled four into one. It is at this point that the cut roving waste before spoken of is mixed in the proportion of three laps of raw stock to one lap of roving or bobbin waste. The speed of this beater is about 1,450 revolutions per minute, which gives the cotton passing it about 42 beats or blows per minute. The total weight of the lap at the front of this picker is 39 pounds or about a 14-ounce lap. These laps are then taken to the card, the draft of which for this class of work should not exceed 110. The fillet on the cylinder should be of No. 34 American wire or 110s English count and on the doffer and top flats should be No. 35 wire or 120s English count. The top flats should make one complete revolution every 45 minutes.

THE CARDS

should be stripped (both cylinder and doffer) three times a day and ground at least once a month. The cards should be reset after every grinding in all parts, except the top flats to the cylinder, which should be reset at least four times a year. The weight of sliver at the delivery end of the card should be about 65 grains per yard. The cotton is next put through three processes of drawing frames. Metallic rolls may be used to good advantage on work of this description, the speed of the front roll at each process being 400 revolutions per minute. The weight of the sliver at the finisher drawing frame should be about 70 grains. The cotton is next put through the slubber and made into .55 hank roving.

The roving is then put through

THREE PROCESSES

of fly frames. At the first intermediate it is made into 1.50 hank roving, at the second intermediate into 3 hank and at the jack frame into 9. This roving is then taken to the ring spinning room and spun into 40s yarn on a frame with the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1⅜ inches; length of traverse, 6½ inches; twist per inch, 28.46; revolutions per minute of spindles, 10,000. From here it is passed to the spooler and then to the twister, where it is twisted into 2-40s, and then back to

the spooler. From here it goes to the warper and from the warper the beams are put up at the slasher, where it is sized, and then it is ready for the weave room.

Dyeing Particulars.

These goods are dyed in the piece if solid shades are wanted, but if two-colored fancies are made, the warp and the worsted yarn are dyed in the yarn, woven and finished. For piece dyes union colors are used, or the wool is dyed in an acid bath, rinsed and the pieces are cotton dyed cold.

For union black, 5 per cent union black A, 30 per cent Glauber's salt. Boil till wool is dyed, and run without steam till cotton is dyed up to shade; if cotton is not dark enough add some cotton black.

The union fancy colors are dyed in the same way.

Wool yarn dyeing. For 100 pounds yarn, 10 pounds Glauber's salt, 3 pounds sulphuric acid. Enter pieces at 150 degrees, bring to boil and boil 40 minutes.

LIGHT SAGE GREEN.

1¼ ounces orange I I; 1¼ ounces cyanole B B; ¼ ounce fast yellow S.

MEDIUM SAGE GREEN.

6 ounces orange I I; 2 ounces fast yellow S; 1 pound cyanole B B.

DARK SAGE GREEN.

10 ounces orange I I; 3 ounces fast yellow S; 1¼ pounds cyanole B B.

MEDIUM OLIVE GREEN.

1½ pounds fast yellow S; 6 ounces orange I I; 1 pound cyanole B B.

OLIVE GREEN.

2½ pounds fast yellow S; ½ pound orange I I; 1½ pounds cyanole B B.

BOTTLE GREEN.

3 pounds fast green bluish; ½ pound fast yellow S; ½ pound formyl violet S 4B.

NAVY BLUE.

2 pounds indigo blue S G N; 2 ounces formyl violet S 4B.

DARK NAVY BLUE.

4 pounds indigo blue S G N; ½ pound orange I I; ½ pound formyl violet S 4B.

SLATE.

6 ounces alizarine blue S A P; ½ ounce orange I I; ½ ounce fast yellow G.

RED.

4 pounds fast red N S; 6 ounces orange I I.

ROSE.

3 pounds rhodamine B; 1 pound rhodamine 5G.

SCARLET.

3 pounds brilliant scarlet 1R.

BROWN.

2½ pounds orange I I; ½ pound fast green bluish; 3 ounces fast acid violet 10B; ½ pound fast yellow G.

The warps are dyed in the chain dyeing machine with fast sulphur colors if possible. For 100 pounds warp:

BLUE.

8 pounds immedial indone 3B; 16 pounds sodium sulphide; 8 pounds glucose; 3 pounds soda ash; 15 pounds Glauber's.

SLATE.

3 pounds thion black G; 3 pounds sodium sulphide; 2 pounds soda ash; 20 pounds Glauber's.

FAWN DRAB.

6 pounds immedial cutch O; 6 pounds sodium sulphide; 2 pounds soda ash; 20 pounds Glauber's.

GREEN.

4 pounds immedial yellow D; 4 pounds immedial indone 3B; 8 pounds sodium sulphide; 2 pounds soda ash; 30 pounds Glauber's salt.

OLIVE.

7 pounds immedial olive 3G; 2 pounds immedial dark green B; 10 pounds sodium sulphide; 30 pounds Glauber's salt; 3 pounds soda ash.

NAVY BLUE.

10 pounds immedial dark blue B; 10 pounds sodium sulphide; 30 pounds Glauber's salt; 3 pounds soda ash.

The fancy shades can also be dyed with one dip salt solors and tannine basic colors.

CALICO.

A calico may be defined as a cotton cloth with a figured design printed on one side; generally speaking, any printed cloth coarser than muslin, used principally for inexpensive dresses, such as shirtwaists, wrappers, and so on.

The majority of inexpensive cotton fabrics are constructed on the one-up, one-down system, or plain weave. Calico is no exception to the rule. Its ornamentation, however, is given it after the cloth comes from the loom.

As mentioned above, calico is a printed cloth,

THE PRINTING

being effected by means of a printing machine, which may be described as an elaborate machine with a rotating impression cylinder, on which the design has been stamped, or cut. The cloth, in passing through the machine, comes in contact with the impression cylinder. The cylinder, revolving in a color trough, takes up the color and leaves the impression of the design on the cloth. Calicoes may be seen in almost any color. The printing machine is capable of printing several

COLORS

in one design. Calicoes, however, are usually in but two colors, that is, one color for ground and one for the figure.

The ground color in most cases is effected by dyeing the cloth in some

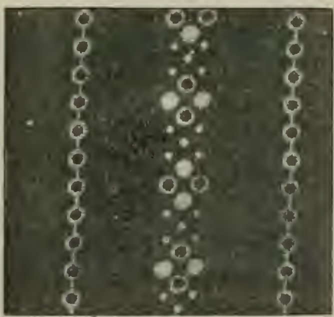


Fig. 1.

solid color. After the cloth is dyed, the design is printed on to the cloth.

The printed designs on calicoes may be somewhat elaborate or they may be some simple geometrical figures. In order, however, to comply with the true principles of art, such fabrics as calicoes should have but simple geometrical figures for their ornamental features.

Fig. 1 shows a sample of calico, with a printed geometrical figure, the simplicity of which is in harmony with the structure of the fabric.

We may here mention that with all machine repeating designs the figures must be laid out in conformity with the dimensions of the printing roll. For instance, say, the printing roll measures six inches in circumference, and the design which we wish to print is but two inches in its vertical repeat, in order to have perfect repetition we must have three repeats of the design stamped on the impression roll.

The circumference of the printing roll will, therefore, control the size and proportion of the design. The design must be so adjusted that the repeat will occur with the utmost accuracy.

Calicoes are made in comparatively narrow widths. The one under discussion is but 23½ inches, finished.

ANALYSIS OF FABRIC.

Width of warp in reed, 25½ inches; width of fabric finished, 24 inches; ends in finished cloth per inch, 72; ends in warp, 1,700; ends per inch in reed 66 2-3; 1,200x2 reed.

Take-up of warp during weaving, 7 per cent; weight of fabric, per yard, from loom, 2 ounces; weight of fabric finished, 2 ounces; warp all 1-30s carded peeler.

Filling: 52 picks per inch in loom; 52 picks per inch finished.

Design.

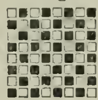


Fig. 2.

Drawing-in-draft.

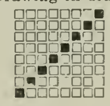


Fig. 3.

Counts 1-30s carded peeler.

LOOM REQUIRED.

The Northrop loom would be the most economical loom to use for calicoes and similar fabrics. The warp is usually sized, in order to strengthen the yarn. In the sizing process about 10 or 15 per cent of weight of sizing material is added to the yarn, which consists chiefly of wheat flour or potato starch.

FINISHING.

The cloth, after it comes from the loom, is sent to the dyehouse. The first process is to boil it off, after which it is immersed in the dye tub. Calicoes are given what may be termed a "cheap cotton dye." By "cheap cotton dye" is meant that the colors are not fast, but will run or fade when subjected to water.

After the fabric is dyed, it is then given to the printer, who ornaments the face of the cloth with some geo-

metrical design; after which it is practically ready for the merchant.

Carding and Spinning Particulars.

The yarns that make up calico may be made in either the first or second division of mills, as given in a previous lesson. The counts of the yarns used for the particular fabric for this article are 1-30s, both warp and filling, and these are made out of 1⅜ inches staple peeler cotton. After being sampled, several bales are placed around the bale breaker, and fed to this machine, a little from each bale. By doing this a

MORE EVEN YARN

is apt to be obtained. After passing through the bale breaker the cotton is conveyed either by endless lattices or blower and trunking to the cotton bins. As large a mixing as possible should be made at one time. The raw stock for this fabric is put through an opener and three processes of picking. The opener is never allowed to become less than half full when machine is running, for reasons given in previous articles. The beater of this machine runs at a speed of about 900 revolutions per minute. After passing through this machine, which is generally connected directly with the breaker picker, either by trunking or by an endless lattice, the cotton comes under the action of the feed rolls of the breaker picker, which compress it into a sheet, and it is in this form that it is presented to the beater. For this class of work a

TWO-BLADED BEATER

is used and the speed of the beater at this machine is 1,400 revolutions per minute. The total weight of a lap at the front end is 40 pounds, or about a 16-ounce lap. These laps are put up at the intermediate picker and doubled four into one. The speed of the beater for this machine is about 1,350 revoolutions per minute. The total weight of lap at the front is 37 pounds or 12 ounces to the yard. These laps are put up at the finisher picker, and doubled four into one. It is at this point that the cut-roving waste is mixed in with the raw stock in the proportion of three laps of raw stock to one lap of roving waste. It is understood that the bobbin waste has to go through a special process before being mixed with the raw stock. The speed of the beater for this machine is about the same as that of the intermediate picker, 1,350 revolutions per minute. This gives the cotton passing under its action about 42 beats per inch. The total weight of a lap at the front is 35 pounds or a 13-ounce lap. These laps are then taken to the card room, as needed, and put up at

THE CARD.

This card should have a draft not exceeding 100. The cylinder fillet for this class of work should be composed of No. 33 or 100s English count wire, and the doffer fillet and that of the top combs of No. 34 wire or 110s English count. The speed of the lickerin is 300 revolutions per minute, and the top flats make one complete revolution every 50 minutes. The cards should be stripped three times a day, and ground at least once every month, and set at the time of grinding. Keep parts at the front of card cleaned of all fly and collect the fly from the flats before it accumulates and falls over the doffer or goes up under the flat comb and gets onto the flats. The weight of the sliver at the front should be 65 grains per yard, the production about 750 pounds per week of 60 hours. From the card the sliver is put through

THREE PROCESSES OF DRAWING.

At these machines the doubling is six into one. The draft at the different processes is as follows: Breaker, 4.50; intermediate, 7; finisher, 7.20. The setting of the rolls is as follows: Distance between front and second, 1½; between second and third,1⅝,third and back, 1⅞ inches. The front roll makes 400 revolutions per minute. The weight of sliver at the finisher drawing is 72 grains per yard. The drawing sliver is put through the slubber where it is drawn into .60 hank roving. Set rolls as follows: front to second, 1½ inches; second to back, 1¾ inches.

The slubber roving is put through two processes of fly frames at the first intermediate. The hank roving is 2.25 hank and at the next process it is drawn into 6. hank. The lays per inch of the roving on the bobbin at this machine are 33. Look out for the top rolls to see that they are always in the best of condition. From the jack frame the roving is taken to

THE SPINNING ROOM

where it is spun into 30s yarn. The particulars for a warp frame are as follows: Gauge of frame, 2¾ inches;

diameter of ring, 1⅝ inches; length of traverse, 6½; speed of spindle, 9,800 revolutions per minute; twist per inch 26.02. The yarn is then taken to the spooler and then to the warper. From the warper the beams are put through the slasher. A good sizing to be used for this fabric is as follows: Water, 100 gallons; cornstarch, 50 pounds; tallow, three pounds; turpentine, one gill. Boil 30 minutes if the cloth is woven on a common loom. If woven on a Draper loom use of water, 100 gallons; potato starch, 50 pounds; tallow, three pounds; turpentine, one gill. Boil 30 minutes.

The filling yarn (30s) is made on a frame fitted as follows: Gauge of frame, 2¾ inches; diameter of ring, 1⅝ inches; length of traverse, 6 inches; speed of spindles, 8,300 revolutions per minute; twist per inch, 19.16.

Printing Particulars.

Most of the designs for calicoes and cotton cloth printing are made in Paris, which has been the headquarters for many years of new styles and fashions.

The design is taken by the sketch maker,and drawn to scale, so that the engraver can apply it to the copper roller. Formerly all the printing was by hand (block) printing. Now machines are made to print from one to 24 colors.

A 12-color machine is the largest generally used, but there are a few 24-color printing machines in Europe. Each color has a separate roller and the engraver has to make the pattern fit on every roller, so that when the piece is printed the design is not spoilt and the colors mixed up.

ENGRAVING THE ROLLERS

is done by hand or machine, by the pentograph or the die machine.

The printing machine turns out about 400 to 800 50-yard pieces a day. There have been times where 1,000 50-yard pieces have been run in 12 hours, a one-color pattern, but for some designs and cloths only 250 pieces are run in a day.

The pieces are singed and bleached, then sheared and brushed to take away all lint from the face of the piece.

The pieces arc printed, dried, and steamed to fix the color, afterwards soaped and washed, then finished and folded, and made up, ready for the market, being generally packed in 20-piece lots, to be shipped to any point of the compass. There are

MANY STYLES

of calico printing. At present the steam styles are most prominent. The colors are the fastest and brightest to be obtained. The most important styles will now be considered. First in the list are alizarine colors, of almost every hue and shade, reds, pinks, purples, browns, blues, yellows, oranges, etc. Alizarines are fixed on the fibre by chrome mordants.

BLUE.

Three pounds alizarine blue S paste, 20 per cent; one gallon starch thickening; three pounds acetate chrome, 20 degrees Tw. After printing,the pieces are steamed for one hour, four pounds steam pressure, then soaped and washed.

BASIC COLORS

are good bright, fast colors fixed with tannine: 10 ounces auramine, 1½ pints of water, 1⅛ pints of acetic acid, 10 degrees Tw.; 6 pints gum water, 1x1; 2¼ pints acetic acid tannic acid solution, 1x1. Steam and run through a bath of tartar emetic; wash and dry. The basis colors are very bright, and consist of every shade in the rainbow.

Extracts of various dyewoods are still used for some styles, fixed with chrome or alumina.

PIGMENT STYLES

are fixed with albumen as vermilion red, chrome green, ultramarine blue, etc. Indigo blue is dyed, then discharged white, yellow, orange and other colors are printed on the dyed pieces. Aniline black is an important style with many resist colors printed first, the black padded afterwards and oxidized. This is extensively used.

Patterns are printed on the cloth with mordants of iron and alum. The cloth is then aged and dunged, dyed with alizarine, and the old madder styles produced, which were in such demand 50 years ago. Then there are turkey-red styles, with discharge white, yellow, blue, green, black on red ground; discharge white and colors on blues, browns, wines, etc. Indigo blues are dyed in the vat with a large proportion of synthetic indigo and discharges printed on. There is also direct indigo printing with the glucose process.

New styles and combination of colors are produced every month and faster and brighter colors printed each season.

PERCALE.

Percale may be defined as a closely woven fabric, made with a good quality of cotton yarn. Percale is of French origin and was originally made with linen yarn, hence the name, as it is sometimes called French cambric.

The finer qualities of percale are used for handkerchiefs, aprons, etc. When used for these purposes they are not printed, but bleached, after the fabric comes from the loom.

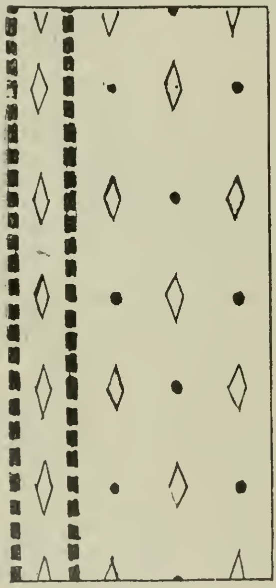


Fig. 1.

Percale, however, is chiefly used for dress fabrics, such as shirt-waist suits for spring and summer wear, and as such, is quite common.

Percale, when intended for dress fabrics, is usually printed on one side with some neat geometrical figure. The printed figure is usually in black, although some may be seen in red or blue. The fabric is bleached before it is subjected to the printing operation.

A CHARACTERISTIC FEATURE

of percale is the lack of gloss, or its dull finish, due to the fact that it is not subjected to any pressure during the finishing process. Percales may also be described as plain woven fabrics with a printed design on one side.

The color used for the printed figures is quite durable, in so far that it will not readily fade and will wear almost as long and well as the fabric.

The printed designs on percales are usually plain but neat geometrical figures. The polka dot pattern is quite common. It produces a very neat effect, especially when dots are in black. Striped designs are also very common. Some very neat effects may be obtained when using a stripe in connection with some simple geometrical figure.

Fig. 1 shows on an enlarged scale a design for a stripe percale. The stripes as a rule run in the direction of the warp. Stripes running vertically tend to increase the appearance of height, while stripes running horizontally tend to decrease the impression of height; for this reason short persons are advised to select dress goods with the stripe running vertically.

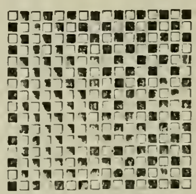


Fig. 2. Weave.

No. 3—4 repeats.

Percale, like most cotton fabrics, is made in several qualities, as regards counts of yarn used, and the number of ends and picks per inch. We will here give an analysis of a good grade:

ANALYSIS.

Width of warp in reed, 38½ inches; width of fabric finished, 36 inches; ends per inch, finished, 85; ends in body of warp, 3,080; 20 ends for selvedge; total ends, 3,100.

Take-up of warp during weaving 6 per cent; weight of fabric per yard from loom, 3½ ounces.

Finished weight, 3½ ounces per yard; warp, all 1-30s carded peeler; reed, 1,400x2.

Filling, all 1-36s combed peeler, 74 picks per inch in loom; 74 picks per inch, finished.

LOOM REQUIRED.

Percale, like most cotton fabrics, is

woven on looms with high running speed. Percales are plain woven fabrics, consequently no dobby is required. The Northrop loom would be the most economical loom to use in the manufacture of percale, or if a Northrop loom is not available use any plain weaving loom and draw warp straight on 8 harness. Considerable care should be exercised in the weaving. No broken picks should be allowed to pass, as they will show quite distinctly in the finished fabric.

FINISHING.

After the fabric comes from the loom it is sent to the bleach house, where it is first boiled off. Then it is bleached. After the bleaching process the fabric is ready for the printer. After the printing operation the fabric is slightly stiffened, by being passed through a size trough. The size used for stiffening is usually corn, wheat, rice, barley, potato or farina. Any of these will give the desired effect.

The fabric passes from the sizing trough on to the drying cylinders, after which it is folded; then it is ready for shipment.

Carding and Spinning Particulars.

The counts of yarn of which percale is composed are made in mills of the second division. The counts of yarn vary according to the quality of the cloth. In this lesson we will consider the count of the filling yarn to be 36s and the warp yarn to be 30s. The filling yarn is combed and the warp yarn is carded peeler of 1 5-16ths inches staple. The cotton is brought from the storehouse and sampled, and all bales of the same length and grade of staple are placed around the bale breaker. The cotton is fed from each bale alternately to the breaker. From the breaker it is conveyed automatically to the so-called mixing bins, either by endless lattices or a blower and trunking, or a combination of both. The latter method is the better one because it

HELPS TO DRY OUT

the cotton better. At the mixing bins the sliver waste from all the machines up to the slubber is mixed in. The sliver waste should not be thrown in in long lengths, but should be broken into short lengths, so that it will not become wound around the pin roller of the hopper. The raw stock is next put through a hopper and either two or three processes of pickers. The hopper should be kept well filled so as to insure a uniform amount of cotton always being delivered to the pin roller. This machine is generally provided with a porcupine beater. The cotton is delivered on to an endless lattice, which carries it to the feed rolls of the picker. These feed rolls compress it and present it to the beater. This beater is generally of the rigid type, having two or three arms, generally two.

SPEED OF BEATER

This beater has a speed of 1,500 revolutions per minute, if of a 2-bladed type, or 1,000 revolutions per minute if it has three arms. The total weight of the lap at the front of the breaker picker is 40 pounds or a 16-ounce lap. These laps are put up at the intermediate picker and doubled 4 into 1. The speed of this beater is about 1,450 revolutions per minute for a 2-bladed, or 975 revolutions per minute for a 3-bladed beater. The total weight of a lap at the front is 37 pounds or a 12-ounce (per yard) lap. These laps are put up at the finisher picker and doubled 4 into 1. At this picker the cut roving waste of the same length of staple and cotton is mixed in in the proportion of 3 laps of raw stock to 1 lap of cut waste. The speed of the beater for the machine is 1,200 revolutions per minute for a 2-bladed, or 800 revolutions per minute for a 3-bladed beater of a rigid type. The total weight of a lap at the front is 35 pounds or a 12½-ounce lap. A variation of one-half pound from standard total weight of lap is allowed at this picker. All laps weighing over 35½ pounds or under 34½ pounds should be run over again. The laps are taken to

THE CARDS,

where the draft should not exceed 100 for this class of goods. The speed of the various parts is as follows: Licker-in, 300 revolutions per minute; cylinder, 160 revolutions per minute; doffer (24 inch), 9¼ revolutions per minute. The top flats have one revolution every 45 minutes. The weight of the sliver at the front should be about 65 grains, and the production about 600 pounds per week of 60 hours. At this point the sliver for the filling yarn and that for the warp yarn separate, that for filling yarn being taken to the comber. Before being put through the combers the sliver has to go through one or more processes. These vary according to the different ideas of the ones in charge; sometimes the sliver is put through a drawing frame and sliver lap, and sometimes through a sliver lap alone. The

GENERAL METHOD USED

is to put it through a sliver lap machine and then a ribbon lap machine. It is the general custom of late day

to use 8 head combers running a 10½-inch lap. The following calculations are made on this basis. At the sliver lap machine the carded sliver is doubled 20 into 1. The draft of this machine is about 2. The laps are put up at the ribbon lap machine and doubled 6 into 1. These laps are put up at the comber and doubled 8 into 1. The production of this machine is about 600 lbs. per week of 60 hours. The sliver is then put up and run through two processes of drawing frame and doubled 6 into 1. The weight of the sliver at the front of the finisher drawing frame is 65 grains per yard. The speed of the front roll is 350 revolutions per minute. This sliver is next put through the slubber and made into .50 hank roving. This is next put through three processes of

FLY FRAMES,

the hanks at the different processes being as follows: 1st, 1.40; 2d,3, and jack, 9 hank. From here the roving is taken to either the mule room or the ring spinning room. We will consider that it is taken to the ring spinning room, where the frame for spinning 36s would be as follows: Gauge of frame, 2¾ in.; diameter of ring, 1¼; length of traverse, 5; twist per inch, 27.96; revolutions per minute of spindles,7,400. After the spinning frame the yarn is carried to the weave room.

The sliver for warp yarn after leaving the card is put through

THREE PROCESSES OF DRAWING

the weight of the sliver at the finisher drawing being 70 grains per yard, the revolutions per minute of the front roll being 350. This is put up at the slubber and made into .50 hank roving, after which the roving is put through two processes of fly frames, the hank roving at each being as follows: 1st, 2, and jack,7 hank. The roving is taken to the spinning room and spun into 30s yarn on a frame having the following particulars: Gauge of frame, 2¾ in.; diameter of ring, 1¾ in.; length of traverse, 6½ in.; twist per inch, 26.02; revolutions per minute of spindles, 9,-800. The yarn is next taken to the spooler, then to the warper, and from here to the slasher.

Bleaching and Finishing Particulars.

Percales are very carefully handled in the finishing process.

The goods are bleached in a kier with 4 degrees caustic soda, washed and boiled with another process of 4 degrees caustic soda, washed and chemicked at ½ degree Tw. for six to eight hours, being laid in bins. Then they are soured with ½ degree sulphuric acid, and well washed and dried. Some finishers place each piece in the kiers separately, and also in chemic tubs and souring bins, as, if sewed in long lengths, and run through the machinery in the rope form, the pieces are dragged and the threads are not straight across the piece. Spots and small figures are printed on the goods in navy blue, brown, black, green and other colors.

DARK NAVY.

Eight ounces new fast blue F; 2 ounces methyl violet 3 R; 1¼ pints water; 1½ pints acetic acid 10 degrees Tw.; 7 pints thickening; 8 noggins acetic acid and tannic acid (1-1).

DARK ROSE.

Four and one-half ounces rhodamine 5 G; 3 pints acetic acid 10 degrees Tw.; 5 pints water; 3½ pints mucilage tragacanth (70-1,000); 4 noggins acetic tannic solution (1-1).

IMPERIAL PURPLE.

Four ounces methyl violet 4 R; 3 pints acetic acid 10 degrees Tw.; 3 pints mucilage of tragacanth (70-1,000); 5 pints water; 2 noggins acetic tannic solution (1-1).

GREEN.

Four ounces malachite green; 1¼ pints acetic acid 10 degrees Tw.; 5 pints gum water (1-1); 4 noggins acetic tannic acid (1-1); 2 pints water.

GRAY.

Two ounces new fast gray; 5 pints mucilage of tragacanth (70-1,000); 3 pints albumen water (1-1); 3 pints water.

The above colors are steamed for one hour with five pounds steam. They are run through a solution of tartar emetic, 2 ounces to gallon, soaped and rinsed, then dried.

STARCHING.

Six to eight ounces white German dextrine, 1 gallon water. Mix cold and boil for 20 minutes. After starching, dry on a tenter frame.

PERCALINE.

Percaline, like percale, is a plain woven fabric made with a good quality of single cotton yarn for both warp and filling. The similarity extends no further; the difference between the two fabrics lies chiefly in the weight and finish.

Percaline is a lighter fabric and

has a very glossy finish, or, more properly speaking, a moory finish percaline is usually dyed in solid colors. Percale, on the other hand, is a bleached cloth with a dull finish and usually with a printed design on one side.

Percaline is used chiefly for feminine wearing apparel, principally for linings, petticoats, etc. These purposes require that the cloth shall be of solid color, the darker colors being preferred, such as dark blues, dark green and black,which have the greatest sale. It may, however, also be seen in lighter shades, such as a medium blue, a light shade of brown and various shades of tan.

Percaline, as mentioned above, is a plain woven, single-yarn fabric. The

WARP YARN IS SIZED

in order to facilitate the weaving. A fabric like percaline requires very little detail work, as far as the designing is concerned. The most attention is given to the finishing process. In order to get a good glossy finish a certain number of ends and picks per inch are required.

It is important, in laying out the ends and picks per inch, that the de-

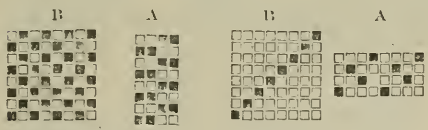


Fig. 1. Fig. 1. Fig. 2. Fig. 2.
Chain Drafts. Drawing-in Drafts.

signer bear in mind that unless sufficient yarn is used, the fabric will not acquire the desired effect in the finishing.

This glossy or moory finish is quite a characteristic feature in a percaline. The more ends and picks per inch used, the more gloss the fabric will possess when finished.

ANALYSIS.

Width of warp in reed, 37.5; width of fabric finished, 36; ends per inch, 84; ends in warp, 3,050; 1,400x2, reed.

Take-up of warp during weaving, 7 per cent; weight of cloth per yard from loom, 2.5 ounces; weight of cloth per yard finished, 3 ounces; warp yarn, 1-30s combed peeler.

Filling,1-40s, 84 picks per inch from loom.

Picks per inch finished, 84.

LOOM REQUIRED.

Percaline is woven in the gray on high running speed looms, with four or eight harnesses. When four harnesses are used, the warp is generally drawn in the following order: 1, 3, 2, 4. (See Fig. 2A.) When eight harnesses are used, it is drawn straight. (See Fig. 2 B.) Fig. 1 A: design for skip draw four harnesses. Fig. 1B: design for eight harnesses straight draw.

The Northrop loom would be about the best loom to use, principally on account of production obtained with these looms.

FINISHING.

The finishing process will include from the time the cloth comes from the loom until the cloth is ready for use.

The first process to which the cloth is subjected is to boil it off, that is, by soaking it in boiling water; this process partially relieves it from any foreign matter that it may have gathered during the weaving and at the same time prepares it for the dye tub.

After the fabric is dyed, it is sized in order to stiffen it and also heighten the gloss on the cloth.

After the sizing, it is ready for the calender. In order to still more add to the gloss on the face of the fabric. the cloth is usually doubled lengthwise, or sometimes two pieces are placed together, back to back, and run through the calender at the same time. Before the cloth reaches the calender rolls it passes between two perforated steam pipes, which wet the cloth considerably, then between the rolls of the calender, which are well heated and tightly set together. The above-mentioned processes produce what is termed a moory finish.

The cloth after it comes from the calender is lapped on small boards, after which it is ready for the market.

Carding and Spinning Particulars.

The carding and spinning particulars applicable to the manufacture of percale. given in the last article may be followed also with reference to percaline, with a few minor changes: Thus the count of the filling yarn is to be 40s, instead of 36s. The filling and warp yarns are both carded peeler, and the cut roving is put through a special process that takes out the twist and delivers it in a fluffy state. This is then put through a picker, which forms it into a lap, and these laps are dealt with as before described. All laps weighing over 35½ pounds or under 34½ pounds should be run through the finisher picker

again, being mixed in with the other laps in the proportion of one re-run lap to three regular laps. This is done so that the weight will not vary from the standard. At the cards a 26 or 27 inch doffer should be used if possible, the larger the better, and the production should be 650 pounds per week of 60 hours. The sliver for both the warp and filling yarn is put through three processes of drawing, and the roving to make the warp yarn through two processes of fly frames. The following size mixing may be used at the slasher: Water, 100 gallons; cornstarch, 50 pounds; tallow, three pounds; turpentine, one gill; boil three minutes. The slubber roving for filling yarn is put through three processes of fly frames. We will consider that it is taken to the ring spinning worm, where the frame for spinning 40s would be as follows:

Gauge of frame, 2¾ inches; diameter of ring, 1⅜ inches; length of traverse, 5½ inches; speed of spindles, 8,800: twist per inch, 23.72.

After being spun, the filling yarn is treated so that it is delivered to the weave room in a moist state. This is accomplished by different methods in different mills, some using a steam chest, while others simply immerse the filling in water just before it is carried to the weave room.

Dyeing Particulars.

PEARL.

One-quarter per cent diamine dark blue B; 10 per cent Glauber's; 2 per cent sal soda.

LIGHT TAN.

One-quarter per cent diamine fast yellow B; ⅛ per cent diamine brown G; 1-16 per cent diamine black B H; 10 per cent Glauber's; 2 per cent sal soda.

LIGHT BROWN.

One-quarter per cent tetrazo brown R; ¼ per cent tetrazo yellow M; ⅛ per cent tetrazo black N; 10 per cent Glauber's; 2 per cent sal soda.

LIGHT BLUE.

One-eighth per cent diamine sky blue F F; 20 per cent Glauber's; 1 per cent sal soda.

LILAC.

One-quarter percent tetrazo chlorine lilac B; 10 per cent Glauber's; 2 per cent sal soda.

ROSE.

One-quarter per cent tetrazo chlorine rose; 10 per cent Glauber's; 1 per cent sal soda.

MEDIUM BROWN.

One per cent diamine fast yellow B; 1 per cent diamine brown B; ¼ per cent diamine black B H; 20 per cent Glauber's; 2 per cent sal soda.

ROYAL BLUE.

Three per cent tetrazo brilliant blue B B; 30 per cent Glauber's; 2 per cent sal soda.

PINK.

One-quarter per cent tetrazo pink G G N; 20 per cent Glauber's; 1 per cent sal soda.

NAVY BLUE.

Two per cent diamine blue B; 3 per cent diamine black B H; 30 per cent Glauber's; 2 per cent sal soda.

DARK GREEN.

Five per cent diamine green B; 1 per cent diamine black H W; 30 per cent Glauber's; 2 per cent sal soda.

DARK BROWN.

Two per cent diamine fast yellow B; 3 per cent diamine brown B; ½ per cent diamine black B H; 30 per cent Glauber's; 3 per cent sal soda.

WINE.

Three per cent diamine Bordeaux B; 30 per cent Glauber's; 3 per cent sal soda.

SCARLET.

Three per cent diamine scarlet B; 30 per cent Glauber's; 3 per cent sal soda.

BLACK.

Fifteen per cent immedial brilliant black; 15 per cent sulphide sodium; 3 per cent soda ash; 30 per cent Glauber's.

BEDFORD CORD.

Bedford cord is a name given to one of the most popular types of fabrics, the distinguishing effect of which is a line stripe and raised cord effect running lengthwise of the cloth, the cords being of more or less prominence.

Figs. 1, 3 and 6 show examples.

They are a standard type and are made in a large variety of weights. The cords vary in width from about 1-20th to ¼ inch. Although usually made with cotton, the name refers to the weave rather than to a combination of weave and material. Sample

for Fig. 3 is a worsted bedford cord.

The face effect of bedford cords is generally plain, although twill face cords are occasionally made.

Fig. 1 illustrates a plain faced bed-

Fig. 1.

ford cord, made with weave Fig. 2. This is the simplest type of bedford cord weave, but is not used to any extent on account of some of the picks, A and B, bringing widely differing proportions of warp and filling on the face from picks C and D, making it hard on a loom.

These ends weave plain throughout and have twice as many interlacings as the other ends in each repeat.

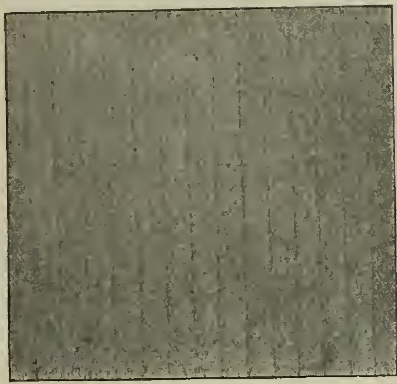


Fig. 6.

The remainder of the ends weave plain on one-half of the picks only, and are then raised out of the way and the filling allowed to float under them for the other two picks, the

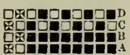


Fig. 2.

Fig. 4.

Fig. 5.

Fig. 3 illustrates a sample made with Fig. 4. This shows practically the same effect as Fig. 1, but has been made with an easier weave.

Figs. 4 and 5 will serve to show the two principal forms of construction of bedford cords.

Fig. 4 is complete on 24 ends and 4

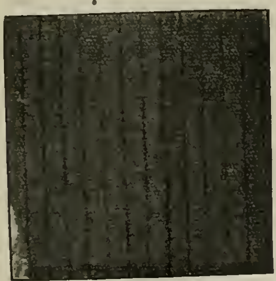


Fig. 3.

picks. One repeat of this weave makes two ribs or cords in Fig. 3. The line or cut effect is formed by ends 1 and 2, and 13 and 14, shown in type ⊠

cords alternating so that when one rib is weaving plain, the same pick of filling is floating under the next one. The plain picks of the succeeding repeat slide over and cover these long floats of filling, making the face effect plain and yet striped.

The advisability of using this type of weave in preference to that shown in Fig. 2 is in the fact that it allows the ends of one cord to be raised out

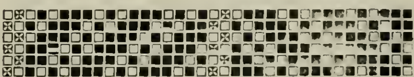


Fig. 7.

of the way, while the other is weaving plain, and the loom is allowed to raise the same number of ends on each pick.

As every two picks of filling interlace only with the ends of every alternate rib, and float at the back of the next one, solid lines of color lengthwise of the piece may be made by arranging the warp yarns of one rib of one color and those of the other rib of

a different color, and picking the filling 2 and 2 so that each color interlaces only with the same color of warp. A variety of colored stripes may be made by combining the types Figs. 2 and 4, varying the number and sizes of sections as desired.

To get extra weight without altering the appearance of the face, extra warp yarns, termed wadding ends, are inserted between the face weave and the filling floating at the back of the rib. When these wadding ends are coarse, they give a pronounced rounded appearance to the cord, more so than if several ends of finer yarns are used. Wadding ends are generally coarser than the face ends.

Fig. 5 illustrates the type of weave used when a bedford cord is required with a fine face and a heavy weight, or where a well-rounded cord is desired. Ends shown with type ▫ are wadding ends. These are always raised when the filling is floating at the back of the cord and depressed when the filling is interweaving with the face ends.

Fig. 6 illustrates a bedford cord with a twill weave on the face. The twill runs to the right in one rib and to the left in the next one, making a herringbone effect. Fig. 7 shows the face weave for Fig. 6, ends 1 and 2 and 19 and 20 being the cutting ends.

The weave for this particular sample has been made on the principle shown in Fig. 2, but weave Fig. 8 would be preferable. In this figure type ⊠ indicate cutting ends; ▫ wadding ends; ⊟ and solid black type face cord ends; solid type and ⊠ show the face weave. The wadding ends would be drawn 2 in each heddle. There are 12 of these in each rib.

The cutting ends in Fig. 6 might have been arranged to work 2 and 2, instead of plain, because of the large number of picks per inch and the relative amount of interlacing of the other ends. When the face weave is plain, two plain ends should separate the ribs.

Bedford cords are firm fabrics, somewhat heavy on account of the large number of ends and picks required per inch. They are usually woven with a coarse reed in a fairly heavy single box loom. One warp only is required unless the counts of the wadding and face yarns differ.

The question of dividing the two cutting ends with the reed or of putting them in the same dent depends upon the effect desired and the quality of the fabric. The stripes may be varied in width as desired, or the sizes of the different ribs in one pattern may vary within certain limits.

The construction of samples for Figs. 1, 3 and 6 are as follows:

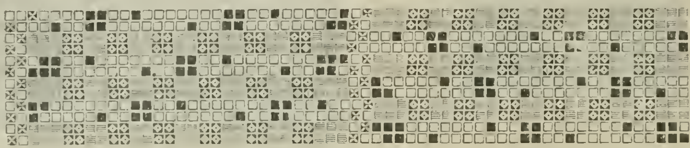


Fig. 8.

For Fig. 1, 96 sley, 88 pick; for Fig. 3, 116 sley, 108 pick; for Fig. 6, 220 sley, 156 pick.

No. 6 contains 132 face ends and 88 wadding ends per inch, making a total of 220.

Carding and Spinning Particulars.

The machinery for the manufacture of bedford cord will be found in the second and third division of mills, as given in a previous lesson. There are generally three counts of yarn used for each piece of cloth, one for filling, one for the warp, and one for the cords. These counts vary according to the quality of the fabric being made, generally several different qualities being made under one management. The counts of yarn which will be considered in this article as composing the cloth will be number 40s for warp, number 60s for filling and number 20s for the cord or wadding ends. These counts are made up of a good quality of cotton of about 1⅜ to 1⅝ inch staple. At the mixing bins the waste sliver up to the slubber is mixed in as collected, which should be done at regular intervals during the day. The one in charge of the picker room should see that too much waste is not being made and also that the sliver is well torn to pieces before being put into the mixing. A good way to check how much waste is being made is to have the picker man weigh it as it comes in and at the end of every week give his list to the overseer. In this way the overseer may be sure that he is getting a correct list of the amount of waste be-

ing made and can act accordingly. The raw stock is put through either two or three processes of picking,

TWO PROCESSES OF PICKING

being generally used, although the particulars for three processes will be given here. The raw stock is fed to the hopper and from here passes under a beater, the speed of which is 1,050 revolutions per minute. From here it is conveyed to the feed rolls of the breaker picker, in a fluffy state, by an endless lattice. The feed rolls condense it and present the sheet of cotton to the action of the beater, which is generally of the rigid type, having either two or three arms. If a two-armed beater is used, the speed should be about 1,500 revolutions per minute, and if a three-bladed beater, the speed should be proportionately less. The total weight of the lap at the front should be about 40 pounds or a 16-ounce lap. These are put up at the intermediate picker and doubled 4 into 1. The speed of this beater should be about 1,400 revolutions per minute, the total weight of the lap at the front being 35 pounds or a 14½-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. It is at this point that the

CUT ROVING WASTE

is mixed in, it having first been made into a lap after passing through a special process, in the proportion of one lap roving waste to three laps raw stock. The speed of this beater, if of a two-bladed rigid type, should be about 1,350 revolutions per minute, which gives the cotton passing through it about 40 beats per inch. The total weight of the laps at the front should be about 35 pounds or a 12½-ounce lap. A variation of half a pound either side of standard is allowed. Laps with a variation of more than the above should be treated as given in a previous article. The laps are put up at the card, the draft of which should not be less than 100. The speed of the top flats should be one complete revolution every 45 minutes. The wire fillet used should be of medium fineness, about number 110 for cylinder and number 120 for the doffer and top flats.

THE WEIGHT OF SLIVER

at the front should weigh 65 grains per yard, the production for the 40s and 60s yarn being 650 pounds per week of 60 hours, and for the 20s yarn 750 pounds per week. This sliver is put through three processes of drawing, six ends up, the revolutions per minute of the front roll being 400 at the finisher drawing. The weight at the finisher drawing should be 70 grains per yard. The drawing should be sized three times a day, and if the variation is more than one grain per yard, the draft gear should be changed to keep the drawing at standard weight. The drawing sliver is put through the slubber and made into .50 hank roving.

FLY FRAMES.

The roving for 40s and 60s yarn is run through three processes of fly frames and for 20s is run through two processes. For 60s yarn the different hanks at each process are as follows: First intermediate, 1.50; second, 4; jack, 12 hank. For 40s yarn the details are as follows: First, 1.40; second, 3.40; jack, 10. For 20s yarn: First, 1.50; second, 4.50. The warp yarns are frame spun and for 40s use a frame the same as given in a previous lesson. For 20s use a frame having a gauge of 2¾ inches, diameter of ring 2 inches, length of traverse 7 inches.

The filling yarn may be either mule or ring spun; if the latter, use a frame having a gauge of 2¾ inches; diameter of ring, 1¾ inches; length of traverse, 5½ inches; revolutions per minute of spindles, 8,000. The warp yarn is put through the spooler, warper and slashing machines and then is ready for the loom.

A great many mills comb their filling for weaving bedford cords.

Dyeing Particulars.

SLATE.

Two per cent immedial black N B; 2 per cent sodium sulphide: 2 per cent soda ash; 20 per cent Glauber's salt.

PEARL.

One-half per cent immedial direct blue B; ¼ per cent immedial black N B; 1 per cent sodium sulphide; 2 per cent soda ash; 20 per cent Glauber's salt.

BROWN.

Three per cent immedial cutch O; 5 per cent immedial brown R R; ¼ per cent immedial black N B; 9 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's salt.

BLACK.

Fifteen per cent immedial black N

N; 15 per cent sodium sulphide: 3 per cent soda ash; 30 per cent Glauber's salt.

BOTTLE GREEN.

Eight per cent immedial dark green B; 1 per cent immedial yellow D; 9 per cent sodium sulphide; 30 per cent Glauber's; 3 per cent soda ash.

NAVY BLUE.

Four per cent immedial indone B; 4 per cent immedial indone R; 8 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's.

RED.

Six per cent benzo fast red 4 B; 30 per cent Glauber's salt; 3 per cent sal soda.

PINK.

One per cent erika pink; 2 per cent sal soda; 20 per cent Glauber's salt.

SKY BLUE.

Four per cent tetrazo sky blue F; 2 per cent sal soda; 30 per cent Glauber's salt.

IMPERIAL PURPLE.

On a tannine and tartar emetic mordant. Dye 2 per cent methyl violet 2 R.

CHINTZ.

Chintz is a fine, soft, cotton fabric, printed with elaborate designs of flowers and foliage in several colors. The fabric is used principally for household purposes, such as lambrequins, coverings, etc. It is also utilized for such purposes as masquerade dresses and the like.

Chintz is but a plain woven fabric, elaborately ornamented with designs by means of the printing machine, several different colors being employed. From this point of view we will consider the fabric.

COLORINGS FOR CHINTZ.

There is practically no combination of colors that may not be used for the ornamentation of a fabric of this description. However, the high-colored designs are most popular. Following are

POINTS TO CONSIDER

in planning a design for chintz, also colors to use. In the first place it is necessary to have a clear idea of what the main characteristics of the design are to be, before the work of arrangement is begun. The character of the design should be influenced largely by the purposes the fabric is intended for; this brings in the question of fitness, which is the application of a certain class of design to certain materials. It is evident that the style of design that would be suitable for a floor covering would be entirely unsuitable for a printed cotton fabric. The consideration of style is a subject that the designer is bound to be governed by, simply because the designs are for a commercial purpose; consequently in planning a design, the style, scale and character of the design, the material it is to be applied to, and its purposes should be understood by the designer. Chintz is

A PURELY ORNAMENTAL FABRIC.

The designs, therfore, may be rich, both in colors and design. In Figure 1 we give an idea of the character of design used for fabrics of this description. The ground may be a light shade of blue, the leaves and stems in two shades of green, while the flowers may have three shades of red graduating from pink to dark red; a happy blending of color is essential to the well-being of a design.

ANALYSIS.

	Inches.
Width of warp in reed	36½
Width of fabric finished	35½
Ends per inch finished	72
Ends in warp	2556
Selvedge	24
Total ends in warp	2580

Reed 1250x2

Take-up of warp during weaving, 5 per cent; weight of fabric finished, 1½ ounces per yard.

Warp yarn 1-44 cotton.

Filling 56 picks—1-80 cotton.

LOOM REQUIRED.

Chintz is usually woven on high running speed looms, such as a Northrop loom. The warp is drawn in on eight harnesses, straight drafting. The warp yarn is well sized so as to avoid breakages of the warp in the weaving.

FINISHING.

The fabric, after it comes from loom, is sent to the printing house, where it is boiled off, preparatory to the printing operation; chintz is not dyed; all the colors are applied by means of the color rolls in the printing machine. Several rolls are required, each roll having a separate

portion of the design and likewise a separate color.

After the printing, the fabric is

passed through a calender press, the rolls of which are well heated and tightly set, which gives the glazed finish which the fabric possesses.

Carding and Spinning Particulars.

The yarns of which chintz is composed are made in mills having the second division of equipment of machinery. The yarns which make up the sample under description are as follows: filling yarn No. 80s and warp

yarn 44s. The filling yarn is made of good cotton of 1½ inches staple. This is put through a bale breaker, as has been previously described. Either two or three processes of picking may be used, many overseers claiming the two-process method to be the better.

The raw stock, after being allowed to stand in the mixing bin as long as possible to dry out, is put into the hopper of the opener, and after being lifted up by the spiked apron comes in time under the action of the beater. This beater is provided with four arms, the blades of which are composed of leather. The speed of this beater for this kind of stock is 1,000 revolutions per minute.

THE RAW STOCK

is then passed to the breaker picker by an endless lattice. This lattice should be varnished frequently so as to make it smooth. This not only applies to this lattice, but to all lattices in the picker room. The feed rolls of this machine compress the cotton into a condensed sheet and it is struck from these rolls by a beater. This is generally of a rigid type, having either two or three arms; if of two-blade type it makes about 1,500 revolutions per minute. The laps at the head end weigh 40 pounds or a 16-ounce lap. These laps are put up at the intermediate and doubled 4 into 1. The speed of this beater is about 1,400 revolutions per minute. the total weight of the lap being 37 pounds or a 12-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. It is at this point that the cut roving is mixed in,as has been described in a previous article. The speed of this beater is 1,350 revolutions per minute if of a rigid two-bladed type; if the beater has three blades it rotates proportionately slower. The total weight of a lap at the front is 39 pounds or a 12-ounce lap.

THE EVENNESS OF WORK.

Look out to see that the eveners on all the pickers are in proper working order, for remember the greater part of the evenness of a lap depends upon this part of the picker. See that the drafts are properly directed and of the right strength to do the most good. Keep the fly well cleaned out from under the machines and don't be afraid of oil, but get it in the proper place. Be sure and have everything neat and clean. The laps are put up at the card. It has always been a bone of contention whether it is proper to use a heavy lap and slow speed or light carding and higher speed. Heavy carding means low drafts, and light carding, so called, high drafts. For this lesson light-weight carding will be used. The draft of the card should be 115, which gives a 45-grain sliver. The speed of the flats should be one complete revolution every 40 minutes. The speed of the licker is 350 revolutions per minute. Strip three times daily and clean thoroughly twice a day. Keep front of card free from fly waste all the time. The production of the card for a week of 60 hours is 550 pounds. This is put through

THREE PROCESSES OF DRAWING,

the weight of the sliver at the finisher being 60 grains per yard. The speed of the front roll is 400 revolutions per minute. The top rolls of a drawing frame should always be kept well varnished, the leather being free from flutes, ridges, nicks; in fact, they should be in perfect shape. The drawing sliver is next put up at the slubber and made into .55 hank roving. This is put through three processes of fly frames, the hank roving at each process being as follows: First, 1.50 hank; second, 4.80 hank; fine or jack, 16 hank. This roving may be taken to either the mule or ring spinning room. If to the latter, use a frame having the following particulars for spinning 80s yarn: Gauge of frame, 2¾ inches; diameter of ring, 1¼; length of traverse, 5 inches; revolutions per minute of spindles, 7,400; twist per inch, 29.07. The

YARN AFTER BEING TREATED

in some manner to make it damp, is carried to the weave room. What has been said of the cotton for the filling yarn may also apply to the warp yarn with the following exceptions: In the picker room, length of staple, 1¾ inches; weight of lap at finisher picker, 40 pounds. In card room at the cards, draft not over 105; speed of flats, one revolution in 50 minutes. Production 675 to 700 pounds, at drawing frame, weight of sliver, 70 grains per yard; at slubber a .50 hank roving, which is put through three processes of fly frames, the hank at each being as follows: First, 1.50 hank; second, 4 hank; fine, 10 hank. This is carried to the ring spinning room and made into 44s yarn on a frame with the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1½ inches; length of traverse, 6 inches; revolutions per minute of

spindles, 10,000; twist per inch, 29.65. The yarn is then spooled, beam warped, and these are run through the slasher, where the requisite number of ends is run on a warp beam at the head end. A good size mixing is as follows: Water, 300 gallons; potato starch, 54 pounds; Yorkshire gum, 2 pounds; soap (white), 1½ pounds; parafine wax about 1 pound.

Printing Particulars.

The colors for this style of goods are mostly light bright shades.

LIGHT BLUE.

Two ounces methyl blue B; 1 pint acetic acid. 10 degrees Tw.; 2 pints water; 6 pints gum water, 1 : 1; ¼ pint acetic acid tannic acid solution, 1:1.

LIGHT GREEN.

One and one-half ounces brilliant green crystals; 1 pint acetic acid; 10 degrees Tw.; 2 pints water; 5 pints gum water, 1 : 1; ¼ pint acetic acid tannic acid solution, 1 : 1.

LIGHT PINK.

One and one-half ounces rhodamine 5 G; 3 pints water; 1½ pints acetic acid, 6 degrees Tw.; 3 pints tragacanth solution, 70—1,000; ½ pint acetic acid tannine solution, 1 : 1.

RED.

Six ounces rhoduline red B; 2 pints water; 1½ pints acetic acid, 10 degrees Tw.; 6 pints gum water, 1 : 1; 1½ pints acetic acid tannine solution, 1 : 1.

LIGHT MAUVE.

One-half ounce methyl violet 6 B; 2 pints water; 1½ pints acetic acid, 10 degrees Tw.; 6 pints gum water, 1 : 1; ¼ pint acetic acid tannine solution, 1 : 1.

ROYAL BLUE.

Six and one-half ounces Victoria blue B; 1½ pints acetic acid,10 degrees Tw.; 2½ pints water; 6 pints gum water, 1 : 1; 1½ pints acetic acid tannine solution, 1 : 1.

LIGHT YELLOW.

Five ounces duramine I I; 1⅛ pints acetic acid, 10 degrees Tw.; 1¼ pints water; 6 pints gum water, 1: 1; 1¼ pints acetic and tannine solution, 1 : 1.

ROSE.

Four ounces rhodamine 6G; 4½ pints water; 3 pints acetic acid, 9 degrees Tw.; 3½ pints tragacanth solution, 70—1,000; 1 pint acetic acid tannine solution, 1 : 1.

LIGHT BROWN.

Six ounces Bismarck brown G; 2 pints acetic acid. 10 degrees Tw.; ¼ pint glycerine, 45 degrees Tw.; 2½ pints water; 6 pints gum water, 1 : 1; 1 pint acetic acid tannine solution, 1 : 1.

LIGHT OLIVE.

One pint of the light yellow color; 1 pint of light brown color; ¼ pint light green color; well mixed and strained through a cloth. With different proportions of these colors any shade can be obtained.

These colors are well mixed in a tub or copper pan, strained through a cloth, and printed in a printing machine. The pieces are dried, steamed one hour, without pressure, passed through a bath of tartar emetic, soaped at 90 degrees F., washed and dried.

The pieces are then run through a starch mangle and starched, then calendered to finish required.

ORGANDIE (Plain and Figured).

An organdie may be defined as a very fine translucent muslin, used exclusively for dress goods.

The fabric is made in a variety of qualities as regards the counts of yarns used. This naturally influences the number of ends and picks per inch in the fabric. The fabric is also made in a variety of widths, ranging from 18 to 60 inches.

The fabric, as already mentioned, is used exclusively for dress goods. The plain organdie is very popular in pure white or bleached, although considerable quantities are dyed in solid colors of light shades, such as pale blue and various pinks, while the figured organdie is usually bleached, then printed with small floral designs. The printed design is usually in from two to four colors and in delicate shades in conformity with the material.

The design itself is also quite delicate.

In a design for a fabric of this character, the scale of the pattern should not be too large. It should not exceed 4½ inches in the repeating of it as the folds of the dress and the numerous seams would destroy the effect

of the repeat if it were much larger.

The accompanying sketch shows a design for the fabric in question; the design shows a rose spray rendered in a natural manner. A color scheme for the same would be to have the flowers pink or yellow, while the leaves and stems may be in green; this against a white ground should give a pleasing effect. A delicate design and color scheme are essential for this kind of fabric. Organdie, considered in relation to cost, as a wearing material is

quite an expensive fabric; however, the retail price apparently seems to disprove this fact. Our reason for the statement that the fabric is not an inexpensive material is that it has a finish peculiar to itself, so that when subjected to soap and water it will not have the same appearance as before. It loses its crisp feeling entirely; consequently an organdie is worn by many until soiled, then discarded.

ANALYSIS.

Width of warp in reed, 32 inches; width of fabric finished, 30½ inches; ends per inch in reed, 76; ends in warp, 2,440; ends per inch finished, 80.

Reed, 1,400x2.

Take-up of warp during weaving, 7 per cent; weight of fabric, about 15 yards to one pound.

Warp yarn, 1-80 combed Sea Island. Filling, 1-20s combed Sea Island; 88 picks per inch.

LOOM REQUIRED.

Organdie is but a plain woven fabric. The ornamentation of the figured fabric is effected by means of the printing press; consequently any smooth running high speed loom may be used in the weaving of this cloth. However, as the Northrop loom with warp stop motion would answer best, the warp may be drawn in straight on eight harnesses; in using a considerable number of ends per inch, it is safe to use at least eight harnesses, so as to avoid heddle chafing.

The warp preparatory to weaving is given a fair sizing with white gum in order to give it strength.

FINISHING.

The fabric is stiffened by sizing it with such ingredients as dextrine, dulcine, albumen, casein, etc., after which it is run through the calender, which slightly glazes the surface of the fabric, thus completing the finishing process.

Carding and Spinning Particulars.

The yarns of which organdies are composed require the equipment of machinery found in the second or third division of mills, as given in a previous lesson. This class of goods requires a very fine grade of cotton, and generally both warp and filling yarns are made of combed stock. The counts of yarn vary, according to the grade of goods to be made. In this article it will be considered that the make-up of the cloth is as follows: 80s warp and 120s filling yarn. These are made from Sea Island stock of 1⅝ to 1¾ inch staple. Sea Island cotton as a whole requires just as little picking as possible and still get the dirt out. Sea Island cotton is generally put through an opener and one process of picking, although some overseers use two processes. This stock is not put through the bale breaker, but is

GENERALLY MIXED BY HAND.

If any bales are found which are not up in grade and staple they should be placed one side and not put into the mixing. The mixing should be made from several bales at once, so as to get the mixing as even as possible. At this point the sliver waste from the machines up to the slubber is mixed in. The sliver should be pulled into short lengths so that it will not be so apt to become wound around the pin beater of the opener. The hopper should be kept more than half full. The cotton is passed from this machine

directly to the finisher picker; the apron of this picker is divided up into yard lengths and the loose cotton is spread evenly over it. About 10 ounces to the yard is the weight used. The beater for this class of goods is generally of a rigid two-bladed type, the speed of it being less than those that have been previously given. The speed of the beater is about 1,200 revolutions per minute, which gives the cotton of this length passing through the picker about 29 beats per minute. The total weight of the lap at the front of picker is 30 pounds, or a 10-ounce lap. The usual points that have been previously given should be looked out for and in addition the

SPEED OF THE BEATER

should be watched to see that it is not putting neps into the cotton. These laps are put up at the card, the draft of which should be high, not less than 125, and on some Sea Island stock the draft runs as high as 180. The card wire fillet used on the cylinder should be No. 120s (English count) and for the doffer and flats 130s. The flats should be speeded up to take out more flat waste or, in other words, the card with 110 flats should make one revolution every 35 minutes. The flats are speeded up by lagging the flat pulley on the main cylinder shaft. Close settings should be used and these should be gone over every time the card is ground, which should be once every month. Grind lightly. Strip three times a day and keep the cards clean, especially the fronts. The weight of the sliver at the front should be about 45 grains per yard and the production about 225 to 300 pounds per week of 60 hours. Be sure that the feed plate is set at the proper distance from the licker-in, so that the staple will not be broken. On most makes of cards the licker-in is speeded too high for this class of cotton, and better results will be obtained if the speed is dropped to 275 and not more than 300 revolutions per minute. It is claimed that a high speed of the licker-in tends to put neps into the cotton of long staple.

THE LICKER-IN

should be speeded so as to tear the sheet or lap apart and take out the seed, etc., left by the picker. The cotton is next taken to the sliver lap machines and made into a lap. The weight of the lap should be about 300 grains per yard. The doublings at the sliver lap are 14 into 1 when 6-head 9-inch lap combers are used, or 20 into 1 when 8-head 10½-inch laps are used. The laps from the sliver lap machine are doubled 6 into 1 at the ribbon lap machine, the weight of laps per yard being 280 grains. These laps are put up at the comber. The doublings at the comber depend on how many heads it has. For the past two or three years the comber builders have sold practically nothing but 8-head combers, so we will consider that the mill is equipped in this manner. The doublings would then be 8 into 1. For this class of goods from 22 to 25 per cent waste is taken out and the weight of the sliver at the front is 48 grains. This is put through

TWO PROCESSES OF DRAWING

the weight at the front of the finisher drawing being about 60 grains per yard.

Be sure to keep the top leather rolls well varnished and in good condition. See that all parts of the machine are working properly.

The sliver is next put up to the slubber and made into .80 hank roving. In some mills the top leathers are varnished and in addition to this, on long-stapled stock, larger top rolls are used

This roving is put through three processes of fly frames for 120s filling yarn, the hank roving at each process being as follows: At the first intermediate 2.25 hank, at the second intermediate 6.50 hank and at the fine frame 24 hank. On this hank roving it is a good plan to either have self-weighted rolls on second intermediate and fine frames or run them without weights, all the weight being on the back top roll. The roving is then spun on a mule into 120s.

The slubber roving for the warp yarn is put through three processes of fly frames, the hank roving being as follows: At the first, 2.25; at the second, 5 hank, and at the jack, 16 hank. Keep the top leather rolls in good condition and watch the traverse motion. Look out for twist and don't get too much tension, so as to pull the roving when it is between the boss of the front roll and the flyer, as this tends to cause uneven roving. Don't let the hands cut the roving from the bobbin, and weigh the cut roving. This roving is taken to the ring spinning room and spun into 80s yarn on a frame having the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1⅜ inches; length of traverse, 5¼ inches; twist per inch, 39.08; speed of spindles, 9,600. From here it passes through the spooler and warper, and the beams for this machine are put up

at the slasher, and after passing through this machine the required number of ends are run on to a warp at the front end.

A GOOD-SIZED MIXING

for 80s yarn, if sley and pick are high, is as follows: Water, 100 gallons; potato starch, 70 to 75 pounds; tallow, 7 pounds; Yorkshire gum, 3 pounds; soap (white), 2 pounds. Boil 2 hours and let stand 10 hours before using. Keep agitator running and keep size mixing almost at boiling point.

Dyeing Particulars.

Following are dyeing particulars for organdie:

PINK.

Two ounces rhodamine pink 6 G; 1 qt. water; 1½ pints acetic acid 90 degrees Tw.; 3 pints tragacanth solution 70 : 1,000; ¾ pints acetic acid tannine solution .1 : 1.

LIGHT YELLOW.

Four ounces thioflavine T; 2 qt. water; 1½ pints acetic acid, 6 degrees Tw.; 3 pints tragacanth solution .70: 1,000; 1 pint acetic acid tannine solution 1 : 1.

PEACOCK BLUE.

Four ounces turquoise blue G; 2 qt. water; 2 pints acetic acid, 9 degrees Tw.; 3 pints tragacanth solution 70 : 1,000; 1¼ pints acetic acid tannine solution 1 : 1.

ROSE.

Four ounces brilliant rhoduline red B; 2 qt. water; 1½ pints acetic acid, 6 degrees Tw.; 3 pints tragacanth solution 70 : 1,000; 1¼ pints acetic acid tannine solution 1 : 1.

BLUE.

Four ounces methylene blue B B; 2 qt. water; 2 pints acetic acid, 9 degrees Tw.; 2 pints tragacanth solution; 1½ pints acetic acid tannine solution 1 : 1.

GREEN.

Four ounces emerald green crystals; 2½ pints water; 2 pints acetic acid, 6 degrees Tw.; 3 pints tragacanth solution 70 : 1,000; 1½ pints acetic acid, tannic acid solution 1 : 1.

LIGHT BROWN.

Four ounces Bismarck brown B; 1 qt. water; 2 pints acetic acid, 9 degrees Tw.; 3 pints tragacanth solution 70 : 1,000; 1½ pints acetic acid tannic acid solution 1:1.

SAGE GREEN.

Mix together one gallon green color; ¼ gallon light yellow; ½ gallon light brown.

VIOLET.

One ounce methyl violet 4 B; 1 qt. water; 1½ pints acetic acid, 6 degrees Tw.; 6 pints gum water 1 : 1; ½ pint acetic acid tannine solution 1 : 1.

SLATE.

One gallon blue color; 1 pint light yellow; well mixed with ½ gallon tragacanth solution 70 : 1,000.

The color is then strained through a cloth, and is ready to print. All the colors are well boiled in a copper pan. and strained through a cloth. After the printing process, they are dried, steamed one hour without pressure, passed through a bath of tartar emetic, and soaped at 90 degrees F., rinsed and dried. The goods are starched and finished on a tenter frame.

ALBATROSS CLOTH.

Cotton albatross cloth is a plain fabric made in imitation of a worsted fabric of the same name. It is light in weight, and is used principally for dress goods. It is sometimes used instead of bunting for railroad flags. The ends and picks per inch are few and the width of the cloth is narrow.

The items of construction for a cotton albatross are as follows: Warp. 1,024 ends of No. 28s cotton; 16 ends have been allowed for selvedges.

Filling, 48 picks per inch of No. 36s cotton; 48 sley reed.

Width in reed, 23 inches.

Width finished, 21 inches.

This fabric can be made very readily on an automatic loom, or on any of the light, fast running, single box cotton looms, four wire heddle harnesses, or the regular twine harnesses, on the plain cotton loom only being required. If wire harnesses are used on a cam loom, the ends should be drawn through the heddles, 1, 3, 2, 4.

Being considered a fair quality of cloth, it is necessary to match the pick when weaving it.

The goods are finished by being burled, sheared, washed, singed, dyed, rinsed, dried and pressed; care being

taken not to press them too hard.

The singeing process is sometimes omitted.

Albatross cloth is generally sold in white, black, or solid colors, being piece dyed. It is not used to any extent for printing purposes.

Carding and Spinning Particulars.

The yarns for albatross cloth are made in mills having the equipment of machinery found in the second division of mills, as given in a previous lesson. For this article we will consider the filling yarn to be number 36s. This would be made of 1⅜-inch staple American cotton. The warp yarn is 28s count and may be made from the same state and grade of cotton. The mixing is done either by hand or by a bale breaker. The cotton, if mixed in the former manner, should be allowed to stand longer than if mixed by the latter method. This is to allow the cotton

TO DRY OUT.

At this point the good sliver waste from machines up to the slubber is mixed in, care being taken that the sliver is broken up into short lengths. The cotton is next put through an opener and either two or three processes of picking (generally three). The opener hopper should be kept at least half full in order to always have an even amount of cotton fed to the breaker picker. This picker is generally provided with a two-bladed, rigid beater, which rotates at a speed of 1,400 revolutions per minute. The

TOTAL WEIGHT OF LAP

at the front end of this picker is about 40 pounds or a 16-ounce lap. These are put up at the intermediate picker and doubled four into one. This is also provided with a two-bladed, rigid type of beater, the speed being 1,500 revolutions per minute. This style of beater is not always used, as will be noted later. The total weight of lap at the front is about 38 pounds or a 12-ounce lap. These laps are put up at the finisher picker and doubled four into one. At this point the laps of cut roving waste are mixed in in the proportion of one lap of cut roving to three laps of raw stock. The cut roving is treated as before stated.

THE FINISHER PICKER

is equipped with either a rigid or what is called a pin beater. A great many mills are putting in this pin beater on stock up to 1 9-16-inch, claiming that the stock is more thoroughly cleaned. The speed of the pin beater (which has three arms) is higher than that of the rigid type, being 1,500 revolutions per minute, whereas a two-armed rigid type would be run about 1,450 revolutions per minute. The pin beater can be run at a greater speed because it does not strike the cotton a blow but rather tears it apart. If a two-bladed, rigid type of beater is used, it should be speeded up so as to give about 42 beats to each inch of cotton passing through. The total weight of lap at the front should be about 38 pounds. Laps varying more than one-half a pound either side of this standard should be run over again. Observe the general points about the picker room that have been given before. The laps are put up at the card. For this grade of goods

THE DRAFT

should not be less than 100. Use medium wire filled, i. e., No. 120s, for cylinder and No. 130s for doffer and flats. Speed of licker-in, 320, flats one revolution every 45 minutes; use 26-inch or large diameter doffer. Strip three times a day and grind cards all over once a month. Groove setting points frequently and watch the dead roller grinding wheel to see that it is straight.

The weight of the sliver at the front should be about 65 grains, the production being 700 pounds per week of 60 hours. The card sliver is put through three processes of drawing, the weight at the front being 70 grains per yard.

WATCH THE CLEARERS

to see that they are in proper condition. Metallic rolls may be used on this class of work to great advantage. If leather top rolls are used, keep them up in good shape. The drawing sliver is run through the slubber and made into .55 hank roving. This is put through three processes of fly frames for the filling yarn, the hank roving at each process being as follows: 1st, 1.50; 2d, 3.50, and jack, 8.25 hank.

We will consider that the filling yarn is taken to the ring spinning room, where it would be spun in 36s yarn on a frame having the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1⅔ inches; length of traverse, 5½ inches; speed of spindles, 8,900 revolutions per minute. After being treated to make it damp, the filling is taken to the weave room and woven as given above. The roving for the warp yarn is put through two processes of fly frames the hank roving at the first

intermediate being 1.75 and at the jack 5.50 hank. This yarn is spun into 28s yarn on a ring frame having the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1¾ inches; length of traverse, 6½ inches; speed of spindles, 9,700 revolutions per minute. The warp yarn is then taken to the spoolers; from here to the warpers, and the warps are put up at the slasher, the required number of ends being run upon a beam at the head end.

Dyeing Particulars.

LIGHT PINK.

One-half pound Erika pink; 20 pounds Glauber's; 2 pounds sal soda.

SKY BLUE.

One pound diamine sky blue F F; 20 pounds Glauber's; 2 pounds sal soda.

LIGHT SLATE.

One per cent katigen blue black B; 3 per cent soda ash; 20 per cent Glauber's; 1 per cent sodium sulphide.

OLD GOLD.

Two per cent diamine catechine 3 G; 2 per cent diamine fast yellow B; ⅛ per cent diamine black B H; 30 per cent Glauber's; 2 per cent sal soda.

LIGHT SAGE GREEN.

One-half per cent chloramine yellow M; 116 per cent benzo fast orange, S; ⅛ per cent benzo fast blue B N; 30 per cent Glauber's; 2 per cent sal soda.

LIGHT BROWN.

One-half per cent diamine brown B; ½ per cent diamine fast yellow B; ¼ per cent diamine catechine 3 G; 20 per cent Glauber's: 2 per cent sal soda.

LIGHT GREEN.

One per cent diamine sky blue F F; 1 per cent diamine fast yellow F F; 30 per cent Glauber's; 2 per cent sal soda.

PEARL.

One-quarter per cent immedial direct blue B; ¼ per cent immedial black N G; ¾ per cent sodium sulphide; 20 per cent Glauber's; 2 per cent soda ash.

BLACK.

Fifteen per cent immedial black N N; 15 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's.

NAVY BLUE.

Twelve per cent thiogene blue B; 22 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's.

DARK BROWN.

Ten per cent thiogene brown G; 6 per cent sodium sulphide; 30 per cent Glauber's; 3 per cent soda ash.

BOTTLE GREEN.

Ten per cent pyrogene green B; 12 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's.

ROSE.

Mordant for 200 gallons water; 3½ pounds tannic acid; run through, on jig machine, for one hour. Pass through a clean bath of two pounds tartar emetic for 200 gallons water half hour; wash and dye. Two pounds rhodamine 5 G.

ROYAL BLUE.

Mordant as rose. Dye, 1½ per cent Victoria blue B.

ROYAL PURPLE.

Mordant as rose. Dye, ¾ per cent methyl violet R.

TARLTON.

Tarlton is a fine, open, transparent muslin, somewhat similar to an organdie in the feel and finish, though a much coarser fabric. The cheaper grade of tarlton resembles a mosquito netting. Mosquito netting, however, is in a leno weave, while tarlton is but a plain woven fabric. The goods are piece dyed and may be seen in any color; some are finished in pure white or

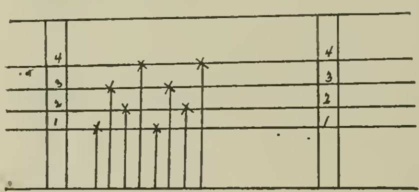


Fig 1. Drawing-in Draft.
(2 repeats.)

bleached. The fabric is used for various purposes, the finer qualities for women's wear. The fabric is principally used for draping and decorating purposes, for foundations for ladies' hats, for bunting around bird cages, for a twofold purpose—first to prevent the birdseed from being scattered to the floor, and second, as a decorative feature. Briefly we may say that the fabric is intended chiefly for draping and decorating purposes, especially the cheaper grades, the meshes of

which are so open that hardly any lady would care to wear a dress made of it, unless she were anxious to exhibit the garments which she would be obliged to wear under it. The grade of tarlton under consideration, of which an analysis will follow, is entirely too flimsy for a dress fabric. If the goods are taken between the thumb and forefinger with any degree of firmness and the surface of the fabric is drawn between them, the threads will readily

Fig. 2.

give, or leave their original place. This would certainly be a poor feature in a fabric intended for dress goods. The fabric is woven in comparatively wide widths; the coarser qualities are commonly 58 inches in reed, including selvedge. The selvedge is about ⅜ of an inch, two ends in one heddle, while the body of goods is drawn one end in one heddle, and each end into a separate dent in the reed.

harnesses, in the following order: 1, 3, 2, 4, the chain being built accordingly so as to give a plain weave. The warp is sized before it is put on the warp beam.

ANALYSIS.

Width of warp in reed, 58 inches. Finished width, 52½ inches; ends per inch finished, 20; picks per inch finished, 18.

Reed, 650x1.

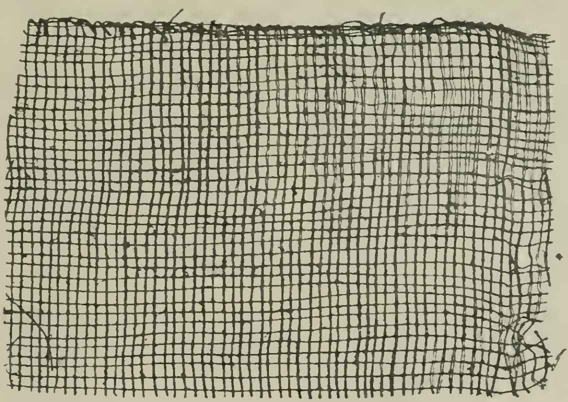
Ends in warp, 1,010; 80 ends selvedge, two ends in one heddle; total, 1,090 ends.

The take-up during the weaving is very little; the take-up in the finished goods, about 1 per cent. After the fabric is finished the threads lie practically straight; this is due to the openness of the mesh. This readily illustrates that the closer the weave, the more take-up of warp yarn.

Warp yarn, 1-50s cotton. Filling, 1-80s cotton. Finished weight, 10 yards equal 7 ounces. The finished fabric carries about 12 per cent of sizing.

FINISHING.

After the fabric is taken from the loom, it is sent to the dyehouse. The



TARLTON.

The goods in weaving have a tendency to roll up, that is, the selvedges roll toward the middle of the fabric; this is overcome by holding out the selvedges by means of the temple. The temple also prevents the chafing of the warp during weaving.

LOOM REQUIRED.

Any light-built loom with a comparatively high running speed will answer for weaving tarltons, providing it is wide enough in the reed space. The warp is usually drawn in on four

first process is to boil it off, in order to rid it of all foreign matter possible; then it is dyed or bleached as required. After this process and after the fabric is dried, it is then immersed in size. Sizing the fabric is usually done in front of the drying cylinders. The goods pass from the size trough on to the drying cylinder, which practically completes the finishing process.

The goods are then doubled and put on to boards in the form of rolls, after which they are ready for the market.

Carding and Spinning Particulars.

The machinery required to make the counts of yarn of which tarlton is made will be found in the second division of mills, as given in a previous article. The counts used for this class of goods differ slightly, but for this article we will consider the counts to be 1-50s for the warp yarn and 1-80s for the filling yarn. These yarns are made of American cotton of about 1⅜-inch staple. This cotton is first mixed by hand, as large a quantity being mixed at one time as possible. In fact, two large mixings should be made so that one batch may be drying out while the other is being used. At this point the good sliver from all the machines up to the slubber is mixed in, it being collected at regular intervals from the machines. An eye should be kept on this

WASTE

by the one in charge to see that too much waste is not being made at any one machine and also to see that it is broken up into short lengths before being put into the mixings. Long lengths of sliver waste are apt to wind around the various rotating parts of the opener and cause a "bung up," which requires time to remove and also is apt to cause a fire.

If trunking is used to connect the opener to the breaker picker, be sure that no scraps of iron or other metal are around where they can work into the cotton, as this is also apt to cause a fire by coming in contact with the metallic parts of the machine and striking a spark, which ignites the other cotton very quickly and often causes a fire on account of the currents of air which fan it into a flame. Keep the hopper full of cotton for reasons previously given. The

SPEED OF THE BEATER

(two-bladed rigid type) of the opener is 1,500 revolutions per minute; the total weight of lap at the front is 40 pounds. These are doubled four times at the intermediate picker. The beater of this machine may be either of a rigid type or a pin beater. If of a rigid type it makes 1,400 revolutions per minute; if a pin beater, 1,450 revolutions per minute. The total weight of lap at the front of this machine is 38 pounds or a 12-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. At this machine the cut-roving waste is mixed in with the raw stock in the proportion of one lap of cut waste to three laps of raw stock. The cut-roving is first put through a process to take out the twist and then run through a picker to form it into a lap. The beater of this machine may be either a rigid or a pin type. If the former, its speed should be 1,450 revolutions per minute; if the latter, 1,500 revolutions per minute. The

TOTAL WEIGHT OF LAP

at the front of this machine should be 38 pounds or a 14½-ounce lap. At this machine all laps are weighed, and if they vary one-half pound from the standard weight they should be put up at the back and run over again. Always keep a supply of laps ahead in case of breakdowns, etc. The laps are then put up at the cards. The speed of the licker-in should be about 325 revolutions per minute; flats should make one complete revolution every 55 minutes. The card clothing should be 110s for cylinder and 120s for doffer and flats. Use a large doffer (either 26 or 27 inch diameter). Strip cards three times a day and see that they are ground all over once a month a whole day (twice a month grinding half a day is better).

ALWAYS GRIND LIGHTLY.

The card clothing should be looked after at intervals to see that it is not faced or hooked. Before grinding, all jams should be taken and flats should be kept free from cotton embedded in the wire fillet. After grinding, the parts should be set in proper relation to each other. The sliver at the front for the class of goods under description should weigh 65 grains per yard and the production should be about 700 pounds per week of 60 hours. The cotton should be run through three processes of drawing frames. It will be found

A GREAT ADVANTAGE

to run metallic top rolls for this grade of goods. The weight of the sliver at the finisher drawing should be about 65 grains, the doublings at each process of drawing being 6 into 1. The hank roving at the slubber should be about .55. The slubber roving for both the warp and filling roving should be put through three processes of fly frames, the hank roving being as follows: for warp, first, 1.50 hank; second, 3.50 hank; jack, 10 hank; for filling yarn, first, 1.50; second, 4 hank; jack, 16 hank.

The roving for warp yarn should be taken to the ring spinning room and spun into 50s count on a frame having the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1½ inches; length of traverse, 6 inches; revolutions per minute of spindle, 10,-

000. The yarn is then spooled and warped and several warps put up at the slasher and the required number of ends run on to a beam at the front. The filling yarn is spun into 80s on a frame having the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1¼ inches; length of traverse, 5 inches; revolutions per minute of spindle, 7,400.

Dyeing Particulars.

Tarltons are dyed on the jig machine, or the color is boiled up in the starching process with the starch. The dyed colors, being faster, are mostly used. The following color is an example of a starched dyeing:

ORANGE.

One gallon of water; 6 ounces dextrine; 2 ounces tetrazo orange C R. Mix cold. Boil for 30 minutes. Pass the pieces through a starch mangle, and dry on tenter frame. All one-dip colors can be dyed after this formula and any shade produced by varying the amount of color.

RED.

Three per cent tetrazo red B; 20 per cent Glauber's; 2 per cent sal soda.

PINK.

Four ounces benzo fast pink 2 B L; 10 per cent Glauber's; 1 per cent sal soda.

LEMON YELLOW.

One-half per cent chrysophenine; 10 per cent Glauber's; 1 per cent sal soda.

GREEN.

Three per cent brilliant benzo green B; 20 per cent Glauber's; 2 per cent sal soda.

WINE.

Two per cent diamine Bordeaux B; 20 per cent Glauber's; 2 per cent sal soda.

SCARLET.

Two per cent diamine scarlet B; 25 per cent Glauber's; 2 per cent sal soda.

LIGHT BROWN.

One-half per cent diamine catechine G; ½ per cent diamine brown B; 20 per cent Glauber's; 2 per cent sal soda.

SLATE.

One per cent diamine black B H; 20 per cent Glauber's; 2 per cent sal soda.

SKY BLUE.

One per cent diamine sky blue F F; 20 per cent Glauber's; 2 per cent sal soda.

NAVY BLUE.

Three per cent diamine blue R W; 20 per cent Glauber's; 2 per cent sal soda.

BLACK.

Five per cent diamine jet black O O; 20 per cent Glauber's; 2 per cent sal soda.

MAUVE.

One-half per cent diamine violet N; 20 per cent Glauber's; 2 per cent sal soda.

GRAY.

One per cent diamine gray G; 20 per cent Glauber's; 2 per cent sal soda.

ROSE.

One-half per cent diamine rose B D; 15 per cent Glauber's; 1 per cent sal soda. The pieces are starched and dried on a tenter frame.

BROCATELLE.

Brocatelle is a coarse brocaded or figured fabric of cotton and wool or silk and linen or cotton, used for tapestry and upholstery and sometimes used for dresses. The brocatelle used for dresses is much finer and necessarily lighter in weight than the fabric used for upholstery purposes.

We will here consider the fabrics used for upholstery purposes only. This may be classed as a double cloth fabric, with two warps and two fillings, a face warp and weft and a back warp and weft. These warps and fillings, however, interweave with one another, thereby binding together the two sets of warp and filling threads, with this peculiarity, that the face warp threads do not show on the back of the fabric nor does the back filling show on the face of the fabric, while, on the contrary, the face filling shows on the back and the back warp threads show on the face.

The face warp threads give body to and also form the ornamental feature of the fabric, which is the raised or brocaded figure in the cloth.

These threads, when not forming the figure, lie buried between the face and back filling picks. The figure thus formed is usually of an eight harness sateen weave, the ends floating over seven back filling picks and under one, while the back filling is used principally to give weight to the fabric and accentuate the raised figure.

Brocatelle, as already mentioned, is made with silk and wool, linen or cotton; the face is of silk, while the back has wool, linen or cotton, depending on the quality of fabric desired, as does

also the quality of silk used in the fabric.

The yarns in all instances are

DYED BEFORE WEAVING.

The colors and number used depend upon the prevailing fashion. Some brocatelles are made up of several colors on the face of the goods, while again others have but two—the figure and ground colors. The figure color is usually darker than the ground. For example, a dark olive may be used for figure color, that is, the face warp threads, while the ground color, face filling picks, may be a light salmon. The back warp is usually the same as the face filling, while the back filling usually blends off to a lighter shade

Dressing, 4 ends olive 50-2 silk; 1 end salmon 2-110s cotton; total, 5 ends per warp pattern.

190 ends per inch in reed; reeded 8 ends 50-2 silk and 2 ends 2-110s cotton in one dent; 19x10 dent reed.

Ends per inch finished 200; finished width of fabric, 49.4 inches.

Filling: 116 picks per inch; 58, 21s silk salmon; 58, 28s linen light olive; total 116.

Linen 300 yards per pound; 10s cotton.

Filling arrangement: 1 pick 21s silk face; 1 pick 28s linen back; total, 2 picks, repeat.

Weight per yard of finished fabric, 14.83 ounces.

Fig. 1.

of olive. The object is to have the colors blend well together and at the same time form a harmonious contrast.

The ornamental feature of brocatelles is elaborate conventionalized floral figures which cover the greater portion of the surface of the fabric, about 75 per cent. The figures are bold and rich, repeating about 4½ times across the width of the fabric. Fig. 1 gives an idea of the character of design used. This is about one-half the size it would be in the fabric.

THE CONSTRUCTION

is as follows:

7,904 ends 50-2 silk face warp.
1,976 ends 2-110s cotton back warp.
16 ends 4-20s white cotton selvedge.

9,896 ends in warp.

Weight of various yarns used:

6.04 ounces face warp.
2.60 ounces face filling.
.70 ounce back warp.
5.46 ounces back filling.
.03 ounce selvedge.

14.83 ounces.

LOOM REQUIRED.

Brocatelle requires a heavy jacquard loom. A Crompton & Knowles combined broad loom, slow speed, would be a good one. The patterns require from 400 to 1,200 ends and over, in order to repeat. Consequently, a machine that can operate the required number of ends is essential for the production of these fabrics. When a great number of ends are required for the repeat of the pattern, two ma-

chines are combined; for example.2-600 machines will operate a 1,200 end pattern, but usually a French or fine index machine is used that will operate the required number of ends.

The pattern to be woven is first stamped on cards by means of a card cutting machine. This machine consists of a punch box, containing 13 punches; if a 600 machine, 25; if a 1,-200 machine, 24 for cutting the smaller holes and one for the peg holes. These cards, when placed on the jacquard machine over the loom, bear a direct relation to the warp threads, raising and dropping them according to the pattern. The warp threads in the drawing in are kept separate from each other; that is, the face warp threads are drawn through certain mails as likewise are the back warp threads, although both sets of threads are represented on the one card.

FINISHING.

These fabrics require no finishing. They are smoothed and folded and then are ready for the upholsterer.

Carding and Spinning Particulars.

The mills which make the cotton yarns for brocatelle will be found in the second and sometimes the first division of mills, as given in a previous lesson. Brocatelle is a fabric made up in many different fibres, but the fabric under description is composed of silk and cotton, the back warp and selvedge being composed of cotton yarns. It is these yarns that we will describe. The cotton back warp yarns are 2-110s cotton yarns.while theselvedge is composed of 4-20s cotton yarns. The cotton used for the back warp of this count would be of a good American cotton of about 1 9-16 inch staple. This yarn should be put through a bale breaker and carried to the bins by means of a blower and trunking. This will insure the cotton at this point being dry, and in a more "picked out" state than when hand mixing is done. The cotton is mixed at the bale breaker in the usual manner,each bale being first stapled to make sure that the cotton is all up to standard.

COTTON MUST BE DRY.

If the mixing is done by hand it should be allowed to stand as long as possible before using, so that it will be thoroughly dry. Too much care cannot be taken at this point as all carders know what trouble damp cotton makes. The good sliver waste from the machines up to the slubber is mixed in at this point, care being taken to see that only the cotton of the same grade and length of staple is thrown into the bin. This waste should not be put all in one place, but should be distributed all over the top and front or back of the mixing. The cotton is next run through an opener and

THREE PROCESSES OF PICKING.

At the opener the hopper should be kept well filled so as to feed the breaker picker an even sheet. The breaker picker beater is generally of the rigid type, either two or three blades being used.

If two blades are used, the speed should be about 1,500 revolutions per minute; if three blades, the speed should be proportionately slower. The total weight of the lap at the front is 37½ pounds or a 14-ounce lap. These laps are doubled four times at the intermediate. This picker is generally provided with a two-bladed beater, the speed of which for this class of cotton should not exceed 1,450 revolutions per minute. Some overseers

PREFER A PIN BEATER

at the machine and a rigid beater at the finisher and some just the reverse. If a bin beater is used, the fan does not have to be run at such a high rate of speed, as this beater creates considerable draught itself. The total weight of the lap at this picker is 36 pounds or a 13-ounce lap. These are put up at the finisher picker and doubled 4 into 1. The speed of this beater, two-bladed rigid type, is 1,400 revolutions per minute. The total weight of the lap is 35 pounds or a 12½-ounce lap. The cotton at this picker receives 42 beats per minute. The laps are put up at the card. The licker-in speed should be about 350 revolutions per minute. The top flats make one complete revolution in 40 minutes. The cards should be ground and set once a month, stripped three times a day and cleaned and oiled twice a day; keep the front of the cards always clean from fly, etc. Collect flat strips at regular intervals, not too long apart, so that they will fall over the doffer and not get into the good work. The sliver at the front should weigh 60 grains per yard, and the production should be 550 pounds per week of 60 hours. This sliver is put through

THREE PROCESSES OF DRAWING.

The top rolls used may be either metallic or leather top rolls. These should be looked out for at all times, but especially so in hot weather to see that they are in perfect condition. Keep

sweaty hands off of the varnish on the rolls. Varnish rolls frequently. A small piece of borax in the mixture will help harden the varnish. The weight of the sliver at the finisher drawing is 60 grains per yard. When the weight is kept at the drawings, they should be sized at least three times a day. This is then put through the slubber and made into .55 hank. The roving is then put through three processes of fly frames, the hank roving at each process being as follows: First, 2.25; second, 6.50, and jack, 18.50. The roving is next spun into 110s on a frame having the following particulars: Diameter of ring, 1⅜ inches; length of traverse, 5 inches; speed of spindle, 9,400 revolutions per minute. This is then spooled, and twisted into 2-ply yarn and then run on a warper and through a slasher.

COTTON USED FOR SELVEDGE.

The cotton to make the selvedge yarn is 1¼-inch staple. At the pickers the changes from the above are as follows: Speed of beater, breaker, 1,500 revolutions per minute; intermediate, 1,450 revolutions per minute and finisher, 1,450 revolutions per minute.

The weights of the laps are as follows: Breaker, 40 pounds or a 16-ounce lap; intermediate, 37 pounds or a 12-ounce lap; finisher,35 pounds or a 12½-ounce lap. At the cards note the following changes from the back warp yarn: Speed of top flats, 1 revolution every 50 minutes; weight of sliver, 65 grains per yard; production per week of 60 hours, 750 pounds.

Draft of card should not be over 100. At the finisher drawing the weight of sliver at the finisher is 70 grains per yard. It is

AN ADVANTAGE

to use metallic top rolls on this stock at the drawing frame. Slubber roving should be .55 hank. There should be two processes of fly frames, the hank roving at each process being as follows: First intermediate, 1.75 hank; second, 5 hank. The moving is then taken to the spinning room and spun into 20s yarn on a frame, the particulars of which have been given before. The yarn is then spooled and twisted into 4-ply 20s.

Dyeing Particulars.

The colors are dyed on the silk, wool, or cotton, in the yarn. The colors used depend on the prevailing fashion.

The following wool colors are dyed in the acid bath of 20 per cent Glauber's salt and 3 per cent sulphuric acid.

For 100 pounds wool yarn:

LIGHT SLATE.

Four ounces patent blue B; ¼ ounce orange I I.

OLIVE BROWN.

One per cent orange I I; ½ ounce lanafuchsine S B; 4 ounces fast yellow S; 1 ounce indigo blue N.

LIGHT BROWN.

Two per cent orange I I, 1½ per cent fast yellow extra; 4 ounces azo crimson L; 6 ounces fast green B.

OLIVE GREEN.

One and three-quarters per cent indigo blue N; 1 per cent tropaeoline O O.

GREEN.

Two and one-half per cent indigo blue N; ½ per cent fast yellow S; 1½ tropaeoline O O.

BLACK.

Five per cent palatine black 4 B.

VIOLET.

Two per cent acid violet 4 B N.

SCARLET.

Two per cent palatine scarlet 4 R.

SALMON.

One and one-half ounces rhodamine 5 G; 20 grains eosine yellowish.

ROSE.

Five per cent rhodamine G.

LAVENDER.

One ounce acid violet 4 B N; 30 grains orange I I; 100 grains fast acid violet 10 B.

SILK COLORS.

Silk yarn is dyed in the soap bath with the addition of acetic acid.

SALMON.

One ounce rhodamine 5 G.

LIGHT LAVENDER.

One-quarter acid violet 4 B N; 100 grains rhodamine G.

OLIVE GREEN.

One per cent fast green B; 1 per cent fast yellow Ex.; 4 ounces orange I I.

ROSE.

One per cent rhodamine 5 G.

NAVY BLUE.

Two per cent indigo blue N; 4 ounces acid violet 2 B N.

RED.

One per cent fast red R.

LIGHT GREEN.

One per cent acid Victoria green S N.

LIGHT YELLOW.

Four ounces tartarzine S.

COTTON COLORS.

BLUE.

Four per cent brilliant benzo blue 6 B: 20 per cent Glauber's; 2 per cent sal soda.

LIGHT BROWN.

Two per cent diamine brown B; 1 per cent diamine fast yellow B; 20 per cent Glauber's; 2 per cent sal soda.

OLIVE BROWN.

Three per cent chloramine yellow M; ½ per cent benzo dark green B; ½ per cent benzo brown B.

TAN.

One-half per cent benzo fast orange S; 2 per cent chrysophenine; 2 ounces benzo fast black.

GREEN.

Eight per cent immedial green G G; 8 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's salt.

NAVY BLUE.

Ten per cent immedial indone 3 B; 10 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's salt.

OLIVE.

Five per cent pyrogene olive G: 5 per cent sodium sulphide; 2 per cent soda ash: 20 per cent Glauber's salt.

RED.

Five per cent benzo fast red 4 B S; 30 per cent Glauber's; 2 per cent sal soda.

TERRY PILE FABRICS.

Terry is a fabric in which the distinguishing effect is small loops of warp yarn, uncut pile, projecting from one or both sides of the cloth, these loops being tied to the ground cloth in regular or irregular order as desired.

The terry principle of construction, which has been developed with the power loom, is used extensively in the manufacture of cotton terry toweling, known generally as Turkish toweling.

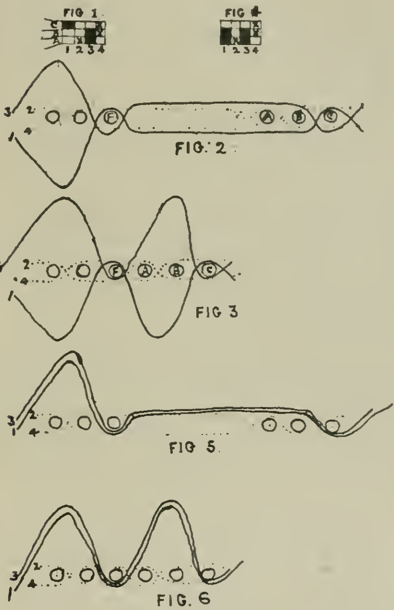
These towels are made in various sizes and grades from the cheap fabrics made almost entirely from waste yarns to those made of the best quality of cotton obtainable.

Terry pile is the simplest of the many types of warp pile goods, the effect being obtained without the use of wires.

Two warps are required: (a) the ground warp; (b) the pile warp.

The ground warp contains the selvedge and ground ends, and is wound on the regular loom beam. This beam is heavily weighted in the loom. The pile warp is usually wound on a light beam and is allowed to let off the warp very easily.

The reason for the difference in tension on the warps is to allow the ground warp to remain tight and the



pile warp to go forward easily when it is required to loop.

Figs. 1, 2 and 3 will serve to illustrate the relation of a terry design to the cloth. Circles indicate picks; dotted lines, ground ends; continuous lines, pile ends. The numbered ends in each figure correspond.

Assuming F to represent the fell of the cloth, and the last pick of a repeat, Fig. 2 shows how the three succeeding picks A, B and C would appear when about to be driven to the fell of the cloth, and Fig. 3 a section of the cloth with the loop completed.

Figs. 4, 5 and 6 illustrate a design and sectional view of a terry cloth in which the pile is distributed on one side of the cloth only. Cloth of this type is used for furniture coverings and as a ground for embroidered effects.

Figured terry goods are made by combining colored yarns and terry

effects, the terry being thrown on either side when the other is weaving a ground weave. The face and back are reversible.

LOOM REQUIRED.

In order to weave terry toweling a dobby loom differing from the ordinary loom is required. The principal point of difference is in its having mechanism to allow two (in three-pick terry) out of three picks to be beaten up to within a certain distance of the fell of the cloth, this distance depending upon the length of pile desired, then forcing these two picks, along with every third pick, to the fell of the cloth.

The object of this is to allow the first two picks to fasten themselves into the pile ends, say one-half inch from the cloth, so that when the three picks are driven home together the pile ends will go along with them, making a loop slightly less than ¼ inch. At the same time the three picks will slide over the ground ends, these interlacing with the filling as in an ordinary cloth.

To accomplish the three-pick movement to form the loop one of two methods is adopted: (a) By a rocking or oscillating reed which is held back or forced to the fell of the cloth as desired; (b) by a rocking whip roll and back roll terry motion. With this device the reed is held firm, the cloth being moved back toward the rear of the loom every third pick. A backward and forward movement, similar to that of the cloth, is imparted to the temples. The length of pile can be varied as desired, or the weave can be changed from terry to regular, or from regular to terry as required.

A loom for weaving terry towels, besides having mechanism for making the pile, contains mechanism for one or more of the following: (a) A box motion, for inserting different colors or kinds of filling; (b) a fringe motion, for making fringe at the end of each towel; (c) a motion for changing the weave from terry to regular construction or vice versa at the beginning and end of each towel. This is usually accomplished with a multiplier or repeater, or with a measuring device which automatically brings into play the pattern chain required.

Terry looms are usually heavily built and contain stands for at least two-warp beams.

FINISHING.

Some toweling is sold in the gray, but most of it is bleached. First process: Boiled with 4 per cent caustic soda, boil for 12 hours, rinsed through water; second, again boiled with 1 per cent caustic soda, boil for 10 hours; third, passed through acid bath, ½ degree Tw. sulphuric acid, rinsed with water; fourth, passed through chlorine water at ½ degree Tw. and laid down in bin until white.; fifth, passed through acid bath of ½ degree Tw. sulphuric acid and rinsed well with water, dried and cut up into towels.

Carding and Spinning Particulars.

The yarns of which terry cloth are made vary from those made of waste stock to those made of long staple combed stock and it would be hard to describe one particular grade to make it cover all terry cloth. For this article we will suppose the average count of the yarn is 1-45s and will give the carding and spinning particulars for this count of yarn in both warp and filling yarns. We will also consider that the stock is carded.

THE MACHINERY USED

would be found in the equipment found in the second division of mills, as given in a previous article. The cotton would be brought from the cotton shed and sampled by the one in charge of this job; sometimes it is the overseer, sometimes the "super," and sometimes, in large mills, a cotton sampler is employed. All bales containing cotton not up to grade or length of staple should be placed at one side and not put into the mixing. The mixing should be as large as possible and may be done either by hand or, as is more generally the custom, by a bale breaker. One bale breaker is able to take care of a great many bales of cotton per week. The cotton is fed to the bale breaker from several bales of cotton, a little being taken from each. This is so that the cotton from all the bales will be intermixed, and in this manner a more even yarn is apt to result. After passing the bale breaker the cotton is conveyed to the mixing bins by an arrangement of endless lattices, which may be moved when it is desired to drop the cotton into another bin.

THE MIXING

should be allowed to stand as long as possible, especially if the mixing is done by hand. The cotton is then put through a bale breaker and three processes of picking. The hopper of the opener or feeder should always be kept more than half full so that the

spiked lifting apron will always be carrying a load to the pin beater. In this manner an even amount of cotton is fed to the feed rolls of the breaker picker. The breaker picker is provided with either a two or three armed rigid type of beater. If two bladed, the speed should not exceed 1,500 revolutions per minute for this grade and staple of cotton (1⅜-inch peeler). The total weight of the lap at the front end of the breaker picker is 40 pounds or a 16-ounce lap. These laps are put up at the intermediate picker and doubled 4 into 1. This picker may be provided either with a rigid or pin type of beater. They both have a great many favorites among the trade. The speed of a rigid two-bladed type should be about 1,450 revolutions per minute.

THE FAN SPEED

should be about 1,050 revolutions per minute. If a pin beater is used, the speed of the fan may be reduced. This is on account of the amount of draft that this beater creates itself. The total weight of the lap at the head end of this machine is 37 pounds or a 12-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. What has been said of the beater at the intermediate picker applies here, except that the speed of a two-bladed rigid type should be 1,400 revolutions per minute. This gives the cotton passing through it about 42 beats or blows per inch. The cut roving is brought to the picker room and put through a special picker (to take out the twist) and then is run through a breaker picker to form it into a lap, and these laps are mixed with the raw stock at the finisher picker in the proportion of three laps raw stock to one lap cut waste. The total

WEIGHT OF THE LAP

at the front of the finisher picker should be about 35 pounds or a 12½-ounce lap. These laps are put up at the card; the draft of which should not exceed 110. The card clothing used should be for carding medium counts. This should be ground at least once a month all over, after which the card should be reset. Use gauges that are straight and not bent all out of shape. The cards should be stripped three times a day and kept clean. The speed of the licker-in should be about 300 revolutions per minute and the flats should make one complete revolution every 50 minutes. The weight of the sliver should be 65 grains per yard, with a production of 700 pounds for a week of 60 hours. Use as large a doffer as possible. This sliver is put up at the drawing frame and doubled 6 into 1. The sliver should be run through ,

THREE PROCESSES OF DRAWING.

Either metallic or leather-covered top rolls may be used to good advantage. Whichever top roll is used, it should be kept in the best of shape. The weight of the sliver at the front of the finisher drawing should be about 70 grains per yard. This is put up at the slubber and made into .55 hank roving. This is put through three processes of fly frames and made into 9 hank, the hank roving at each process being as follows: 1st, 1.25 hank; 2d, 3.50 hank, and fine, 9 hank. This is then taken to the ring spinning room and made into 45s warp yarn on a frame with the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1½ inches; length of traverse, 6 inches; speed of spindles, 10,000 revolutions per minute; twist per inch, 30.19. This is then spooled and warped and the required number of warps put up at the slasher to give the required number of ends at the front warp. For making 45s filling yarn use a frame having the following particulars: Diameter of ring, 1¼ inches; length of traverse, 5½ inches; twist per inch, 25; speed of spindles, 8,500 revolutions per minute.

SATINE, or SATEEN.

Satine, or sateen, is a cotton fabric with a smooth, lustrous surface resembling satin. The latter is made of silk. The weaves for satins and satines are similar.

Satines, which are of two kinds, warp satines and filling satines, are made in a great variety of weights and qualities, and are used for many purposes.

The bulk of the goods are made on the filling satin principle and are used for linings, corset covers, dress goods, etc. These are usually woven white and are bleached, or piece dyed in varying colors.

Warp satines are used for mattress and furniture coverings.

Stripe effects are made by using a warp containing different colors and a warp satine weave. Warp and filling satines are also printed, to a considerable extent, the smooth face lend-

ing itself very readily to this process.

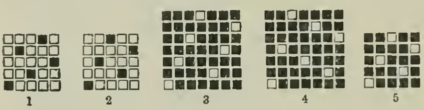
COLORED EFFECTS

made in the loom are confined to stripes made when a warp satine weave is used, because the warp covers the filling almost entirely. In a filling satine the filling practically covers all the warp, and color inserted here would show in barry effect across the cloth.

The smooth, lustrous effect of satines is due in large measure to the weave used. Briefly stated, satine weaves are made on from five ends upwards; they are complete on the same number of ends as picks; each end and each pick interlaces only twice in each repeat; the interlacings do not support each other, at least one end or one pick separating them.

In filling satines each end is raised over one pick only in each repeat; warp satines, vice versa.

Figs. 1 and 2 illustrate the only two filling satine weaves that can be made on five ends. Both of these weaves are



1 2 3 4 5

used in the trade, some buyers preferring one to the other, according to the effect desired.

Figs. 3 and 4 show warp satine weaves on seven ends each.

The constructions of filling satine fabrics vary from about 64 to over 100 sley and 120 to 300 or more picks.

The following, which show results of the analyses of five different satine fabrics, will serve to show that the satine principle of construction is used in fabrics of widely differing qualities.

Sample No. 1. Colored warp satine stripe cloth for upholstery; 96 ends and 52 picks per inch; 7s cotton yarn for warp and 14s for filling. Woven with weave Fig. 5, a 5-end warp satine weave.

The filling in this particular sample is twisted harder than the warp.

Sample No. 2. A fine warp satine of good quality, made with a 7-end weave; 152 sley and 80 picks; 2-50s warp and 30s filling.

Samples 1 and 2, as well as almost all warp satines, on account of the large proportion of warp on the face, would be woven face down in the loom.

Sample No. 3. A filling satine of fair quality; 72 sley and 150 picks; 45s warp and 70s filling. Weave Fig. 1.

Sample No. 4. 96 sley and 280 picks; 45s warp and 97s filling. Weave Fig. 1.

Sample No. 5. 104 sley and 210 picks; 60s warp and 75s filling. Weave Fig. 1.

Samples 4 and 5 are of good quality.

KIND OF LOOM REQUIRED.

Satines, whether warp or filling, are usually woven on single box cam looms of heavier build than plain sheeting looms. The selvedges are actuated by a selvedge motion. If woven on dobby looms, the selvedge motion is dispensed with.

One warp only is required. The ends are drawn through the harnesses in straight order.

In practice it has been found advisable, when weaving heavily picked satines, to use a reed that is no deeper than is necessary. For warp satine, on account of the large number of ends and comparatively few picks per inch, deeper reeds are used, so that the wires will give, to some extent, for knots.

FINISHING SATINES.

Satine tickings are sheared and then calendered with hot steam rollers, the steaming being done in front of the machines; the appearance is improved by gas singeing. A method of finishing ordinary satines is to first saturate them with a mixture of corn or potato starch, China clay or baryta and tallow. To this is added soap or oleine, with wax and glue size. They are then mangled, dried, damped, calendered, folded and pressed.

For printed or dyed satines, starch with a small portion of soda crystals for a stiff finish, and soluble oil with soda for a soft finish are used.

Carding and Spinning Particulars.

Satines are made up of various counts of yarns, the different samples analyzed being only a few of the various grades made, but they illustrate the various grades very well. For the carding and spinning particulars of a satine, sample No. 5 will be taken as an example. This is made up of combed yarns of 60s for warp and 75s for filling. The cotton used would be Egyptian of 1⅜-inch staple. This grade of satine is made in either the second or third division of mills as given in a previous lesson. Of course

THE EQUIPMENT

will have to include combers. The cotton is first sampled and then mixed in a manner that has been described in previous lessons. It is better to use a bale breaker, but cotton may be mixed by hand. If mixed by hand, let the mixing stand a little longer to dry and open out as the cotton is compressed very tightly in the bales.

These bales weigh considerably more than the American bales.

The good waste from the machines up to the slubber should be mixed in at the mixing bin. The cotton is next put through an opener and three processes of picking. The hopper of the opener should always be kept

OVER HALF FULL,

so that an even amount of cotton will be fed to the breaker picker. The breaker picker is provided with either a two or three bladed beater of a rigid type. If the former, the speed should be about 1,350 revolutions per minute. The total weight of the lap at the front should be 40 pounds or a 16-ounce lap. These laps are put up at the intermediate picker and doubled 4 into 1. The beater of this picker is either a two or three bladed rigid or a pin beater. If the former, the speed of it should be 1,250 revolutions per minute. If a pin beater is used, the fan speed should be reduced for reasons given in a previous article. The total weight of the lap at the front should be 36 pounds or a 12-ounce lap. These laps are doubled 4 into 1 at the finisher picker. At this picker the cut roving waste, which has previously been put through a roving picker, to take out the twist, and a breaker, to form the fluffy mass into a lap, is mixed in in

THE PROPORTION

of three laps of raw stock to one lap of cut roving waste. If the equipment of machinery does not include a roving picker, the cut roving is mixed in at the mixing bin, care being taken to spread it over the entire mixing. The speed of the finisher picker beater of a rigid two-bladed type is 1,200 revolutions per minute. The total weight of the lap at the front is 35 pounds or a 12½-ounce lap. These laps are put up at the card. The wire fillet used should be 120s for cylinder and 130s for doffer and flats. Use a 26 or 27 inch diameter doffer. The speed of the cylinder should be 160 revolutions per minute; licker-in, 300 revolutions per minute. Top flats should make one complete revolution in 35 minutes. The draft of the card on this stock should not be less than 125.

THE CARDS

should be stripped three times a day and ground at least once a month, at which time the various settings should be gone over. Set doffer to cylinder with a 5 gauge. The sliver at the front weighs 55 grains per yard and the production is about 475 pounds per week of 60 hours. This sliver is taken to the sliver lap machine and doubled 14 into 1 for an 8¾-inch lap (wide) or 20 into 1 for a 10½-inch lap. These laps are generally put through a ribbon lap machine, the weight of them being 330 grains per yard for an 8¾-inch lap or 380 grains for a 10½-inch lap. The laps are doubled 6 into 1 at the ribbon lap, the weight at the front being 265 for an 8¾-inch lap and 320 grains for a 10½-inch lap. These laps are put up at the comber and doubled either 6 or 8 into 1, according to whether the comber is a six or eight head comber.

THE EIGHT-HEAD COMBER

is the one that is being put in nowadays, very few of the six-head being sold. The speed of the comber should be at least 90 nips per minute, and may run up as high as 105. The percentage taken out should be about 20. The weight of the sliver at the front is 40 grains per yard. The combed sliver is next put through two processes of drawing, the speed of the front roll being 400 revolutions per minute. Either metallic or leather-covered top rolls may be used, generally the latter. These should be varnished frequently and those that are damaged, fluted, loose or not true should not be run. If the latter, they may be buffed, as may also the leather rolls at the comber. See that the stop motions are all in working order, and that the traverse motion is set and working so that the whole surface of the leather rolls is used.

THE SETTING

or spread of the rolls for this stock should be 1⅞ inches front roll to second; 1½ inches second roll to third, and 1⅝ or 1¾ inches third to back roll according to bulk of cotton being fed. The doublings at the drawing frames are 6 into 1. The weight of the sliver at the front is 60 grains per yard. This sliver is put through the slubber and made into .70 hank roving, after which it is put through three processes of fly frames and made into the following hank roving at each frame: First intermediate, 1.75; second intermediate, 4.50; and fine, 15; at the fine frame the lays per inch on the bobbin being 48.

The standard for twist for this kind of cotton is 1.2 multiplied by the square root of the count. For example, the count or hank is 15. The square root of 15 is 3.87, which, multiplied by 12, equals 4.64. If the standard for twist on this frame was 94.9, the twist gear used would be 20. The method by which this is found is by dividing the constant for twist by the standard for twist (American frames). Look out for the leather top rolls, traverse and clearers to see that each

is performing its duty properly. Of course the

SPEED OF THE ROLLS

is very important, the general method being to gain 1-16 of an inch over stock at each roll. The production should be about 33 hank per spindle per week of 60 hours. The 15-hank roving is taken to the ring spinning room and made into 60s warp yarn on a frame having a gauge of 2¾ inches; ring diameter of 1½ inches, and length of traverse, 6 inches; with spindle speed of 10,000 revolutions per minute. The yarn is then put through a spooler and warper and then a slasher. The filling yarn is made from the 15-hank roving on a frame having a 1¼-inch diameter ring, 5-inch traverse and spindle speed of 7,400 revolutions per minute. The roving for the filling yarn may be taken to the mule room, but for this class of goods is generally taken to the ring frame spinning room.

Dyeing and Finishing Particulars.

PINK.

One-half per cent Erika pink; 20 per cent Glauber's; 2 per cent sal soda.

HELIOTROPE.

One per cent tetrazo chlorine lilac B; 20 per cent Glauber's; 2 per cent sal soda.

NAVY BLUE.

Three per cent tetrazo blue Rx; 25 per cent Glauber's; 2 per cent sal soda.

GRAY.

One-half per cent thio gray B; 10 per cent Glauber's; 2 per cent sal soda.

LIGHT SLATE.

One-half per cent direct black S; 20 per cent Glauber's; 2 per cent sal soda.

PEACOCK BLUE.

Two per cent Eboli blue B; 20 per cent Glauber's; 2 per cent sal soda.

RED.

Three per cent direct red B; 20 per cent Glauber's; 2 per cent sal soda.

SLATE.

Two per cent katigen black S W; 2 per cent sodium sulphide; 20 per cent Glauber's; 2 per cent soda ash.

ROYAL BLUE.

Three per cent brilliant benzo blue 6 B; ¼ per cent benzo fast violet R; 25 per cent Glauber's; 2 per cent sal soda.

TAN BROWN.

Three per cent benzo fast orange S; 2 per cent chrysophenine; ½ per cent benzo fast black; 30 per cent Glauber's; 2 per cent sal soda.

SKY BLUE.

One and three-quarters per cent diamine sky blue F F; 25 per cent Glauber's; 2 per cent sal soda.

BROWN.

Three per cent diamine brown B; 30 per cent Glauber's; 2 per cent sal soda.

WINE.

Three per cent diamine Bordeaux B; 30 per cent Glauber's; 2 per cent sal soda.

SCARLET.

Two and one-half per cent diamine scarlet B; 25 per cent Glauber's; 2 per cent sal soda.

Satines are finished by passing through a calender machine to give a fine lustre finish and are sometimes placed on a beetle machine and beetled for two hours. They are starched first with a very light starch, and a little white soluble softening, to give a soft, smooth feel.

MUSLIN---BUTCHER'S MUSLIN.

Muslin is commercially understood to mean a soft cotton fabric, used for various purposes, but principally for dress goods, underwear, sheetings, etc. Some muslins are named from their place of production, as Asoreem, Dacca, India, Madras and Swiss muslin, while some are named from the use to which they are chiefly put, as butcher's muslin, which derives its name from the fact that it is chiefly used by grocery men and butchers in the form of aprons and coverings. It is a strong bleached fabric, well suited for the purposes. Muslin is so called from Mosul, a city on the banks of the Tigris, where was once the chief seat of its manufacture, but to-day large quantities are manufactured in the United States.

The quality of muslin is as varied as are the names by which it is known. Butcher's muslin is but a substitute for butcher's linen. Cotton is cheaper and almost as durable, and because of this it has forced itself to the front. Butcher's muslin is easily distinguished from the others by its coarseness. However, considerable quantities are used for summer outing dresses, for which purposes the bleached fabric only is used. The unbleached is used principally for sheetings and sometimes for pillow-cases. The unbleached fabric is preferred where du-

rability is the chief object. It is a common fact that unbleached fabrics will wear better than bleached.

Muslin is used only in the bleached or unbleached state. The fabric is not dyed.

As previously mentioned, there are various kinds of muslin; in fact, anything in the line of soft cotton fabrics may be termed muslin. The name by which a particular kind is commonly known may vary likewise in quality, as, for example, there are several qualities of butcher's muslin, as an analysis would prove.

Analysis of a fair grade of butcher's muslin, which retails at 15 cents per yard: Width in reed, 37½ inches; finished width, 36 inches; ends in warp, 1,900: 1,844 in body; 28 ends each side equal 56, selvedge; total, 1,900; 900 x 2 reed; 52 ends per inch finished; warp, 1-12s cotton; take-up during weaving, 8 per cent; filling, 40 picks per inch in loom; 42 picks per inch finished; 1-15s cotton; weight per yard in the gray, 5 ounces.

LOOM REQUIRED.

Muslin is a plain woven fabric; consequently any loom may be used in the weaving of these goods. The cost of production is of course reduced in proportion to the speed of the loom and the number of looms a weaver can take care of. The least expense would be incurred by using a Northrop loom.

THE WARP

should be sized so as to withstand the chafing during weaving. As a rule all single yarns are sized before they are beamed. The warp is drawn in on eight harnesses, straight drafting. Fig. 1 shows design.

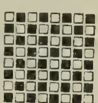


Fig. 1.

FINISHING.

The unbleached receives little or no finishing. After it comes from the loom, it is simply boiled off, dried, made up into rolls and then shipped.

When the fabric is to be bleached, it is first boiled off, then subjected to the bleaching chemicals, after which it is sometimes subjected to a very light sizing, composed of corn, or wheat, glycerine, bees' or Japan wax, after which it is run through a rotary press, then made up into rolls, and shipped.

Carding and Spinning Particulars.

The yarns of which butcher's muslin is made are of a low count and are made in mills of the first division. The grade of cloth is sometimes made up of raw stock and a certain percentage of waste. The raw stock used very rarely exceeds ⅞ inch in staple and is of a low-grade American cotton. While the same care is not taken of this class cotton at the different processes for this cloth, still care should be taken to see that each machine is working properly to its best advantage for production. In this class of goods production is

THE FIRST CONSIDERATION

and quality the second. This does not mean that quality should be sacrificed wholly for production, but that the machines should be driven to a greater extent and the best possible work turned off of them under these conditions. For example, at the card the top flats should not be set or driven at the same speed as when finer goods are made, and so it is with all the machines. The cotton mixings should always be as large as possible and should be allowed to stand as long as possible before being used. This gives the cotton a chance to dry out. A better plan (if there is room enough) is to have two large mixings and use the cotton from one while the other is drying out. If cotton is very damp, the heat should be turned on to help dry it out. This is generally done at night or over Saturday and Sunday. It is at this point that the good waste from all the machines is mixed in, care being taken to see that the waste is spread as evenly as possible over the mixing. As the cotton is generally quite dirty, it is put through an opener and three processes of picking. The hopper of the opener should always be kept full of cotton. The opener is connected directly with the breaker picker and this machine is provided with either a two or three bladed rigid beater. If of a two-blade type

THE SPEED

should be about 1,550 revolutions per minute. The total weight of the lap at the front should be about 40 pounds, or a 16-ounce lap. These laps are put up and doubled four into one at the intermediate picker. This beater is generally of a two or three bladed rigid type and if the former its speed is 1,500 revolutions per minute. The laps at the front of this machine weigh 38 pounds total weight and 10

ounces per yard. The laps are put up at the finisher picker and doubled four into one. This machine is generally provided with a two-bladed rigid type of beater having a speed of about 1,500 revolutions per minute. The laps at the head end weigh 40 pounds or 14½ ounces to a yard. An allowance of 10 ounces either side of standard is made with this staple cotton. If the lap varies more than this, it should be run over again. These laps are put up at

THE CARD.

This should be set coarse and have No. 100 wire fillet on cylinder and top flat, the doffer fillet being No. 110. The draft of card should not exceed 100. Strip cards at least three times a day. The cards on this stock need more stripping than when long-stapled stock is used, because of the greater bulk passing through and also on account of the short staple, which fills up the wire. The card sliver weighs 65 grains per yard and the production should be about 1,000 pounds per week of 60 hours. This is put through two processes of drawing frames. It is of great advantage to use metallic rolls on this class of goods. The speed of front rolls is 400 revolutions per minute. Keep rolls free from dirt and fly. The sliver is put through the slubber and made into .40 hank roving. This is put through two processes of fly frames, having the following hank roving: 1.30 at the first and 3.25 hank at second. The roving is then taken to the spinning room and made into 15s on the filling frame and 12s on the warp frame. Use a warp frame with 3-inch gauge, 2⅛-inch ring and 7-inch traverse, with a 16.45 twist per inch and spindles revolving at 9,000 revolutions per minute. This yarn is then spooled and wound on a warper. Enough beams are put up at the back of the slasher to give a beam with the required number of ends in front. To make 15s filling yarn, use a frame having 2¾-inch gauge, 1½-inch diameter ring, 6¼-inch traverse, 12.59 twist per inch and spindle speed of 6,900 revolutions per minute.

HENRIETTA CLOTH.

Henrietta cloth is a light-weight fabric for women's wear, made in all colors from single worsted yarn, with silk mixture in the best qualities.

The cheaper qualities are made with cotton and worsted, the cotton yarn being for the warp, while the worsted is used for filling. Henriettas are made in various qualities; for example, the "all worsted" from various grades of fine worsted yarn; the worsted and silk mixture from various grades of each; the "cotton and worsted" made up in various qualities of cotton and worsted yarn.

When the fabric is made with different qualities of yarn, that is, the warp differing from the filling in quality or kind, the cheaper quality or kind is in all instances used for warp. The reason for this is readily understood, when the character of the weave is taken into consideration. The weave for this fabric is a one up, two down twill, the weave repeating on three ends and three picks. Fig. 1 shows.

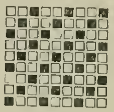


Fig. 1.

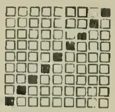


Fig. 2.

nine repeats of the weave; Fig. 2, drawing-in draft. This weave will show but one-third of the warp on the face of the fabric and two-thirds of the filling; the filling is usually of a slightly coarser count than the warp, especially when cotton warp is used, consequently the filling, to a certain extent, covers the warp yarn. The two factors, the weave, viz., $\frac{1}{\quad 2}$ twill and the coarser count of filling, give to the face of the fabric a much finer feel than the back. The feel or handle of henriettas is very important, consequently the above-mentioned particulars should be kept in view when constructing a fabric of this character, as its commercial value is largely influenced by the feel of the fabric.

PIECE DYED.

The cloth is dyed after it is woven. Considerable quantities of cotton and worsted henriettas are bleached or finished in the gray; when the cotton and worsted fabric is to be dyed, the cotton yarn is prepared so as to take color in a worsted dye, otherwise two dyeing processes would be necessary—one for the cotton yarn and one for the worsted. The one dip or union dye makes the cost of finishing but

normal. Preparing the cotton yarn for the worsted dye is accomplished before the yarn is warped or beamed.

ANALYSIS.

Width of warp in reed, 38 inches.
Width of fabric finished, 35 inches.
Ends per inch in reed, 70.
Ends per inch finished, 76.
Reed, 35x2.
Ends in warp 2620, plus 40, 20 ends each side selvedge; total ends in warp, 2,660.
Warp yarn, 1-50s cotton.

FILLING.

1-40s worsted.
64 picks per inch in loom.
66 picks per inch finished.
Finished weight per yard, three ounces.

WEAVING.

Henriettas are usually woven on dobby looms, the speed of which is from 120 to 140 picks per minute; it is essential that the warp is well sized, adding about 15 per cent of weight to the yarn; wheat, flour, sago or potato starch may be used; in connection with this, a small quantity of chloride of magnesium should be added to give the yarn the necessary moisture and pliability.

FINISHING.

First process: After the fabric is woven, it is scoured, then bleached, dyed or left in the gray as the case may be, after which the fabric is subjected to a very light singeing in order to slightly stiffen the cloth, after which it is pressed, then made up into rolls.

Carding and Spinning Particulars.

The yarns which make up henrietta cloth are made up of two fibres, worsted for the filling and cotton for the warp yarn. The count of the warp yarn is 1-50 and this count of yarn would be made up in mills of the second division, as given in a previous article. This equipment should include combers, as this yarn in most grades of the cloth under description is combed. The cotton is mixed in the usual method, which has been described several times. It is

OF GREAT ADVANTAGE

to use a bale breaker for this class of yarns. The cotton is put through three processes of picking, the breaker picker being combined with an opener. The breaker picker is provided with a three-bladed beater, the speed of which is 1,200 revolutions per minute. The lap at the front weighs 39 pounds to the lap or 16 ounces to the yard. These are doubled 4 into 1 at the intermediate picker. This picker has a pin beater, the speed of which is 1,300 revolutions per minute, the fan speed being reduced on account of the extra draft caused by the pin beater. The total

WEIGHT OF LAP

at the front end of this picker is 37 pounds or a 12-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. At this point the cut roving waste is also mixed in in the proportion of 1 lap cut waste to 3 laps raw stock. This picker is generally provided with a two-bladed beater, the speed of which is 1,400 revolutions per minute. Keep the beater blades sharp and properly adjusted. This speed of the beater gives the cotton passing through the picker about 40 beats or blows to the inch. The total weight of lap at front is 35 pounds or a 12½-ounce lap. The lap for this class of work is allowed half a pound variation either side of standard weight; if more than this, it should be run over again because, if put up at the card, it would have a tendency to make uneven work.

AT THE CARD

the following particulars should be observed: Draft of card not less than 110; wire fillet for cylinder, 120s; for doffer and top flats, 130s. Use large doffer. Strip three times a day. Grind all fillet once a month, leaving grinding rolls on all day. Grinding twice a month is better, leaving grinding rolls on half a day. The speed of the licker-in is 300 revolutions per minute; flats, 1 revolution in 35 minutes. The weight of the sliver at the front should be about 50 grains per yard; production, 550 pounds per week of 60 hours. This sliver is taken to sliver lap machines and doubled 14 into 1 for 8¾-inch lap or 20 into 1 for 10½-inch lap. The

SPREAD OF ROLLS.

for this stock (peeler 1½-inch staple) should be as follows: Front to middle, 1¾ inches; middle to back, 1¾ inches. The weight per yard of lap at the front is 300 grains for 8¾-inch lap or 350 grains for a 10½-inch lap. These laps are put up at the ribbon lap machine and doubled 6 into 1. The weight per yard of lap at the front is 265 grains for 8¾-inch lap or 315 grains for 10½-inch lap. This gives a draft of about 7 for this machine. These laps are put up at the comber and doubled either 6 or 8 into 1, ac-

cording to the number of heads on the comber. If 8 heads, the laps should be 10½ inches wide and set as follows: Cushion plate to half lap, 18 gauge; top combs to segment, 20 gauge. Feed at 5½, top comb set to 29 degrees angle; a double row of needles is used on top comb; 18 per cent waste should be taken out.

THE SPEED

should be 100 nips per minute; draft about 40; weight of sliver, 50 grains per yard. The speed of rolls in draw box should be as follows: Front to middle, 1⅝ inches; middle to back, 1¾ inches. This sliver is put up at the drawing frames and doubled 6 into 1 and put through two processes, the speed of front roll at each process being 380 revolutions per minute, the spread of the rolls being as follows: Front to second, 1⅝ inches; second to third, 1¾ inches; third to back, 1⅞ inches. Use leather top rolls on this class of drawing and keep them well varnished and in perfect condition. The weight of sliver at the front of the finisher drawing is 65 grains per yard. This is put up at the slubber and made into .50 hank roving.

AT THE SLUBBER

the front rolls for this class of goods are sometimes varnished, but this is not often done, they being varnished when running on Sea Island stock. The slubber roving is put through three processes of fly frames, the hank roving at each process being as follows: First intermediate, 1.50; second intermediate, 3.50, and jack, 10 hank. Look out for the traverse motion and do not lay roving too close to make triangular roving. This roving is then spun into 50s yarn on a ring spinning warp frame with a 2¾-inch gauge of frame, 1½-inch diameter ring and a 6-inch traverse. The speed of the spindles is 10,000 revolutions per minute, the twist per inch, 31.81. This yarn is next put through a spooler, then a warper and from here to a slasher. A good-sized mixture for this class of goods is as follows: Water, 100 gallons; potato starch, 54 pounds; Yorkshire gum, 2 pounds; white soap, 1½ pounds.

Dyeing Particulars.

This cloth is dyed with union colors, the wool and cotton being dyed in the same bath. The goods are entered into the dye kettle; after the color has been boiled up with from 20 to 30 per cent of Glauber's salt, cool off with water to 120 degrees F. Run the goods for 20 minutes; heat to 200 degrees F. Run for 30 minutes. If wool is not dark enough, boil for some minutes more; when wool is only a shade too light, turn off steam and run for 30 minutes or till the cotton is colored to shade. If the goods are boiled too long the wool will be too dark and the cotton thin.

UNION BLACK.

5 per cent union black B F; 25 per cent Glauber's salt; 5 per cent salt.

LIGHT BROWN.

1½ per cent diamine fast yellow B; ½ per cent diamine orange B; ½ per cent diamine brown M; 6 ounces union black B F; 30 per cent Glauber's; 2 per cent salt.

NAVY BLUE.

3 per cent diamine black B H; 1 per cent union black B F; 4 per cent naphthol blue black; ½ per cent formyl violet S 4 B; 30 per cent Glauber's; 5 per cent salt.

RED.

5 per cent benzo fast red S 4 B; 30 per cent Glauber's; 5 per cent salt.

LIGHT TAN.

100 pounds goods: 1 ounce tetrazo orange G; ¼ ounce union tetrazo black B; ¼ ounce tetrazo Bordeaux G; ⅛ ounce tetrazo brown R; 20 per cent Glauber's salt.

SLATE.

1 per cent diamine black B H; ¼ per cent diamine fast yellow B; 20 per cent Glauber's.

PURPLE.

2 per cent diamine violet N; ¼ per cent union black; 1 per cent formyl violet S 4 B; 30 per cent Glauber's.

SCARLET.

3 per cent diamine scarlet B; 30 per cent Glauber's salt; 5 per cent salt.

PEA GREEN.

½ per cent diamine green B; 1 ounce diamine sky blue; 30 per cent Glauber's.

ROYAL BLUE.

3½ per cent diamine brilliant blue G; ½ per cent diamine violet S 4 B; 30 per cent Glauber's; 5 per cent salt.

DARK GREEN.

2½ per cent diamine black H W; 2 per cent diamine green B; 30 per cent Glauber's; 5 per cent salt.

RUBY.

3 per cent diamine fast red F; ½ per cent diamine Bordeaux B; 30 per cent Glauber's; 5 per cent salt.

36; Hypofull; 70 x 54; 26a28a.

CAMBRIC.

Cotton cambric is a fabric woven with a plain weave, the distinguishing effect being a heavily glazed, smooth surface. The glossy effect is obtained in the finishing process. The goods are somewhat lighter in weight than French percale.

When finished white or in solid colors they are used very extensively

FOR LINING PURPOSES.

The name cambric, like many other names of dry goods, does not signify any special construction or quality of fabric, being made in both linen and cotton materials.

The name is said to have been originally given to a very fine, thin linen fabric made at Chambrey, or Cambrai, in the department of Nord, French Flanders.

Cambric is known in France as batiste, so called, it is said, from its inventor, a linen weaver named Baptiste, of Chambrey. One authority states that French cambric is the finest linen fabric made.

Cotton imitations of the original cambric are of the muslin type and are sometimes termed cambric-muslin.

The finer grades of cotton cambrics are made from hard twisted cotton yarns, and are of good quality.

LOOM REQUIRED.

Any of the light, single-box, fast-running looms are suitable for weaving cambrics, the goods being woven white, then bleached or piece-dyed as required.

The finest grades, where mispicks tend to make second quality goods, are woven on the regular looms. Devices have been invented and tested which change the filling before it is entirely spent, but they have not been successful on fine filling because, coming in contact with the filling every second pick, in practically the same spot, they wear it out before it can be run off the shuttle.

Little attention is paid to mispicks when weaving the lower qualities of goods, and these can be made most economically on the automatic looms.

ANALYSIS.

An analysis of a black cambric of only fair quality shows the following data: Finished width, 36 inches; finished weight, 4 yards per pound; ends per inch, finished, 70; picks per inch, finished, 54.

The average number of the yarns in the finished sample is 24, but on account of the starch, clay, or other filling substance used in the finishing process, the gray yarns would be finer than 24.

To obtain the fabric just mentioned, the following might be adopted, both as to construction and finish:

Width of warp in reed, 38¾ inches.

Warp yarns, 26s cotton.

Filling yarns, 28s cotton.

Eight double ends on each side for selvedges.

Total ends, 2,536.

Seventy sley reed, 2 ends per dent.

Fifty-six picks per inch.

Weight, 4.3 yards per pound from loom.

The finished and unfinished weights do not bear a direct proportion to the average counts of yarns in each case on account of the increase in length of the cloth during the process of finishing.

FINISHING.

After dyeing, open the goods out to the full width and run through a mangle containing the filling substance; then dry.

After drying, dampen in a damping machine and run through a calender.

For a fine white cambric the goods would be bleached, opened out to the full width, run through a starch mangle, containing a light starch or filling substance, the starch being blued to give the shade required, dried, dampened and run through a 5-bowl calender twice, the same side of the cloth being presented to the surface of the brass or steel roll each time.

Carding and Spinning Particulars.

The yarns of which cambric is made are spun in mills having the equipment of the first and second division of mills as given in a previous article. Cambric is made in mills or sets of mills where only this grade of cloth or perhaps two or three other styles of cloth of the same grade of fabric are made and after the proper gears hank roving are once found they are never changed. In fact, a machine or set of machines may run on this grade of goods its whole lifetime, the only changes made being in case of a breakdown, or parts and gears becoming worn out. Cambric is made from American cotton, the length of the staple used being from ⅞ to 1¼ inches. For this article we will consider the staple to be 1⅛ inches in length and the count of the yarn to be as follows: 26s for warp and 28s for filling.

THE MIXING

is generally done by hand, and the

mixings are always as large as possible. In some mills two large mixings are made so that one can be drying out while the other is being used. Better results are obtained by the latter method. The good sliver waste from machines up to the slubber, as well as the cut roving, is mixed in at the mixing bin. The cotton is then put through an opener and either two or three processes of picking, three processes being the general method. The opener is either directly connected with the breaker picker or is connected by trunking; if by trunking, keep it clear, so as not to cause fire. The

SPEED OF THE BEATER,

which is of either a two or three bladed rigid type, is 1,500 revolutions per minute for the two-bladed, or 1,000 revolutions per minute for the three-bladed type. The total weight of the lap at the front of breaker picker is 40 pounds or a 16-ounce lap. These are doubled four into one at the intermediate picker. The speed of this beater, which is generally of a rigid, two-bladed type, is 1,450 revolutions per minute, the total weight of lap at the front being 38 pounds or a 12-ounce lap. These laps are put up at the finisher picker and doubled four into one.

This picker is equipped with a two-bladed rigid style of beater, and makes 1.450 revolutions per minute, which gives the cotton passing through about 42 blows or beats per inch, the total weight of lap at front being 39 pounds or a 14½-ounce lap. The cotton is next put up at the card.

THE CARDS

on which cambric was formerly made are to some extent now used and are known as the top flat card. These are fast going out of date, so that the particulars given below refer to the so-called English card. The draft for this card, for these goods, should not exceed 90. The wire fillet used should be 100s for cylinder and 110s for doffer and top flats. The speed of the cylinder should be 160 revolutions per minute; licker-in, 400 revolutions per minute, and top flats should make one complete revolution in 50 minutes. Grind once a month. Strip three times a day and if running an extra heavy production, strip once more. Set top flats to cylinder to a 12-1000ths gauge and doffer to cylinder to a 7-1000ths gauge. Use large doffer. The

WEIGHT OF SLIVER

at the front of the card should be 65 grains per yard and the production about 750 pounds for a week of 60 hours. The card sliver is next put through either two or three processes of drawing, generally three. The doublings are generally six into one. The speed of the front roll is 400 revolutions per minute. On this class of goods some overseers prefer the metallic top rolls. In calculating the production of a drawing frame with metallic top rolls, it is the general rule to allow one-third more than that figured for leather rolls. It is found, however, that this is too great, and if the allowance is cut down to ¼ or 25 per cent, it will be found about right. Keep metallic rolls clean and well oiled. In figuring

DRAFT OF FRAME

with metallic top rolls, add 7 per cent when draft does not exceed 3.75, and 9 per cent when draft is between 4.60 to 7. If leather top rolls are used, care should be taken to see that they are properly oiled and free from flutes; they should be level, without breaks in leather, and the leather cot should be tight and last should be varnished frequently. A good recipe for a cooked varnish is given below: One quart vinegar, seven ounces glue, two teaspoons gum tragacanth, borax, size of walnut, one teaspoon brown sugar. Cook about an hour. Thicken with lampblack and Princess metallic. One that does not need cooking is as follows: Three ounces glue, one ounce acetic acid, one-half teaspoon brown sugar, one-half teaspoon oil origanum. Dissolve and add color; add one-half teaspoon of borax in hot weather. The bottom steel rolls should be set as follows: Front roll to second, 1¼ inches; second to third, 1½ inches; third roll to back, 1¾ inches. The weight of sliver at the front of the finisher drawing should be 70 grains per yard. This is put through the slubber and made into .40 hank roving. The

SLUBBER ROVING

is put through two processes of fly frames, the hank roving at each being as follows: First intermediate, 1.75, and second intermediate, 5; the setting of the bottom steel rolls at each process being 1 3-16 inches from front to middle and 1⅜ inches from middle to back. The roving is taken to the ring spinning room and spun into 26s yarn on a warp frame having the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1¾ inches; twist per inch, 24.22; length of traverse, 6½; revolutions per minute of spindles, 9,200. The yarn is next spooled and then warped, after which it is put through a slasher. On this class of

goods a heavy sizing is used. The roving is spun into 28s yarn on a filling frame with a 2¾-inch gauge of frame; 1⅜-inch diameter ring; 6-inch traverse; 17.20 twist per inch; revolutions per minute of spindle, 7,300. This yarn is then taken to the steam chest or put through some other process which prepares it for weaving.

Dyeing Particulars.

Cambrics are dyed in the jig machine or the continuous machine. The fancy colors are dyed on the jig. After dyeing, the pieces are starched with a light starch and calendered through a heavy calender.

BLACKS.

One dip salt black, 6 per cent oxydiamine black S A T; 30 per cent Glauber's; 3 per cent sal soda.

SULPHUR BLACK.

Ten per cent immedial black N N; 10 per cent sodium sulphide; 5 per cent soda ash; 20 per cent Glauber's.

BOTTLE GREEN.

Ten per cent thionol dark green; 2 per cent thionol yellow; 15 per cent sulphide sodium; 3 per cent soda ash; 30 per cent common salt.

PEA GREEN.

Two per cent immedial green B B; 2 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

NAVY BLUE.

Three per cent direct indigo blue B E M; 15 per cent salt; 2½ per cent frankhansine.

DARK SLATE.

One per cent Pluto black S S; 40 per cent Glauber's salt; 2 per cent soda ash.

BROWN.

Three per cent tetranil brown O; 30 per cent Glauber's; 3 per cent soda ash.

LIGHT BROWN.

One-half per cent tetrazo yellow M; 1 per cent tetranil brown O; 30 percent Glauber's; 3 per cent soda ash.

OLD GOLD.

Three per cent diamine fast yellow B; ½ per cent diamine bronze G; 30 per cent Glauber's; 3 per cent soda ash.

SLATE.

Two per cent diamine black B H; 2 ounces diamine yellow B; 30 per cent Glauber's; 3 per cent soda ash.

MAROON.

Ten per cent immedial maroon B; 10 per cent sulphide soda; 5 per cent soda ash; 35 per cent salt.

GREEN.

Ten per cent immedial green G G; 10 per cent sulphide sodium; 3 per cent soda ash; 35 per cent salt.

BLUE.

Ten per cent immedial new blue G; 20 per cent sulphide sodium; 5 per cent soda ash; 40 per cent salt.

ECRU.

Three per cent immedial cutch G; 4 per cent sulphide soda; 3 per cent soda ash; 20 per cent salt.

SCARLET.

Five per cent diamine scarlet B; 30 per cent salt.

WINE.

Four per cent benzo fast scarlet 8 B S; 1 per cent benzo fast violet R; 30 per cent Glauber's; 3 per cent sal soda.

PINK.

One-half per cent Erika pink; 20 per cent Glauber's; 2 per cent sal soda.

SKY BLUE.

One per cent diamine sky blue F F; 25 per cent Glauber's; 2 per cent sal soda.

HELIOTROPE.

One per cent diamine violet N; 30 per cent Glauber's; 3 per cent soda.

TIRE FABRICS.

Tire fabrics are, as the name implies, used for automobile, bicycle and other vehicle tires.

They are not actually tires themselves, but form the base or foundation of some kinds of composition and pneumatic rubber tires.

Like other terms denoting the use to which the fabric is to be subjected, as quiltings, bedspreads, shirtings, etc., the term tire fabrics covers a wide range of weights and qualities.

The stock used in the warps for these goods is of good quality,although the single yarns used are not of very high counts.

The weights vary considerably,ranging from about three to 20 ounces per square yard. In one type of goods this excessive variation is due almost exclusively to the ply warp yarns, which vary from 2 to 12 ply, from single yarns varying from about 8s to 40s, according to the weight required. This

type of tire fabric is termed thread fabric.

ANALYSIS.

The analyses of two tire (thread) fabrics of widely varying weights show the following data:

Sample No. 1. Warp ends per inch in reed, 16. Reed, 16; one end in each dent.

Warp yarn, 11-ply 9s cotton.

Filling: One pick per inch of single 40s cotton.

Finished weight per square yard, 13.5 ounces.

The weave is plain. The drawing is in straight order.

One peculiarity of this class of tire fabrics, which will be noticed from the preceding data, is that the filling is used merely to keep the warp yarns in position, not being needed to give strength to the cloth.

Sample No. 2. Warp ends per inch in reed, 68.

Reed, 17; 4 ends in each dent.

Warp yarn, 2-ply 24s cotton.

Filling: One pick of 40s filling every three-quarters of an inch.

Finished weight per square yard, 3.9 ounces.

The ends in Sample No. 2 were drawn 2 as 1 through each heddle eye, in straight order, two picks completing the weave as in an ordinary plain cloth.

For a better quality of fabric with the same construction the yarns would have been drawn in straight order, reeded two ends in each dent, as

Fig. 1.

shown by the vertical lines in Fig. 1, and actuated as indicated by chain draft Fig. 2.

x x
x x

Fig. 2.

By this arrangement the ends working together would have been split or separated with the reed and prevented from rolling over each other.

If woven on a cam loom working four harnesses, the drawing in and reeding would be as indicated in Fig.

Fig. 3.

3, and the lifting of the harnesses as indicated in Fig. 4.

x x
x x

Fig. 4.

Reed ends at lines in Fig. 3, two ends in each dent.

LOOM REQUIRED.

Tire fabrics may be woven on ordinary one-shuttle cam or dobby looms, there being but one warp and one filling, provided provision is made for the proper regulation of the let-off and take-up motions.

On the heavy grades of goods, it is advisable to fold the woven fabric as it is made, instead of running it on a cloth roller, on account of the large yardage produced in a short time.

The two samples analyzed were woven on a heavy loom running about 90 picks per minute.

Carding and Spinning Particulars.

In a previous article the cotton mills were divided into three divisions, each division having a different equipment of machinery. The yarns that make tire fabrics do not come under the head of any of these divisions,but may be classed among those having a special equipment. This is on account of the extra length of staple used, which is very rarely less than 1¾ inches, and from this up to the longest staple grown, 2¼ inches. The stock is. of course, Sea Island. It will therefore be readily understood that the machines in use in the other divisions of mills, having drawings rolls, such as drawing frames, slubbers, fly frames, etc., could not spread the bottom steel rolls the required distance, so as not to break the staple. In order to do this, specially constructed frames have to be obtained, which allow this spread of rolls.

ANOTHER POINT

is that the one main object sought is strength and this is the chief reason why long staple is used, the counts of yarn being extremely low for the length of the stock, i. e., 2-24s warp and 40s filling, so that the additional points that should be looked out for, besides those that will be given below, are to see that the top clearers cover all the top rolls, that the spread of the rolls is enough so that the staple will not be broken, and that the traverse motion is in perfect shape and working properly.

As it is strength that is sought, the cotton is

GENERALLY COMBED

to get all short staple out, but sometimes the stock is only carded. When carded, the carding should be light or, better still, double carding should be used. In this article we will consider

the yarn to be combed. The mixing should be done by hand, the cotton being first stapled to see that it is up to standard, which for this article will be considered as two inches. The cotton, after being allowed to dry out, is put through an opener and either one or two processes of picking, generally one. If one process is used, the lattice is marked off into sections of one yard each and an equal amount of cotton put on to each section to make the required weight lap in front. If two processes are used, the opener is combined with the breaker picker. The speed of the beater of the breaker picker should be about 850 revolutions per minute for a two-bladed rigid type. The total weight of the lap at the front should be 32 pounds or an 8½-ounce lap. These laps are doubled four into one at the finisher picker; the speed of this beater should be 800 revolutions per minute. The total weight of lap at the front should be 27 pounds or a 9-ounce lap. A variation of not over 6 ounces either side of standard should be allowed. All laps outside this variation should be run over. The picker laps are put up

AT THE CARD.

On this class of work the draft of the card should not be less than 140 and from this up to 180. The wire fillet used should be No. 120s for the cylinder and No. 130s for the doffer and top flats. The speed of the cylinder should be 160 revolutions per minute, licker-in 200 revolutions per minute, and top flats should make one complete revolution every 35 minutes. Cards should be stripped three times a day, although some overseers claim that stripping the cylinder twice and the doffer three times a day is plenty. The cards should be ground once a month or oftener if wire is dull. For this class of goods keep wire fillet as sharp as possible. Use close settings, except that of the feed plate to the licker-in, which should be set so as not to break the staple. Pull the staple at the back and front of card at least once a day to see that the length of staple is the same in both places. The weight of the sliver at the front should be from 35 to 45 grains per yard, 45 grains being a good weight.

THE PRODUCTION

should be about 300 pounds per week of 60 hours. Keep front of card clean, so that the short fly, etc., will not get into the good carded cotton. The cotton is next put through the sliver lap machine, where it is doubled 20 into 1 for a 10½-inch lap, or 14 into 1 for an 8¾-inch lap. We will consider that the lap being made is a 10½-inch lap used on an eight-head comber. Set the bottom steel rolls as follows: Front roll to middle, 2¼ inches; middle roll to back, 2¾ inches. In combing this cotton the instructions given in a previous lesson may be followed with the following exceptions: The weight of the sliver lap per yard is 275 grains; at the ribbon lap 260 grains per yard. The cotton lap is next put through the comber. The

SPEED OF THE COMBER

for this stock should be about 85 nips per minute. The doublings are 8 into 1 (for an eight-head comber). The percentage of waste taken out is from 25 to 30. Use close settings, 18 from half lap to segment and 21 from top comb to segment. The sliver at the cam should weigh 45 grains. After the comber use three processes of drawing, the spread of the rolls being as follows: 2⅛ inches from front to second; 2¼ inches from second to third roll; 2½ inches from third to back roll. Look to the top leather covered rolls to see that they are in perfect shape and properly varnished. The weight of the sliver at the front of the finisher drawing should be 60 grains per yard. The doublings at the drawing should be 6 into 1. At the slubber this drawing should be made into .70 hank roving. At this frame

SEVERAL CHANGES

are made, which are as follows: The top leather rolls are varnished, sometimes all three sets, and sometimes only the front rolls. The size of the front leather roll is sometimes increased to 1½ inches, or even to 2 inches in diameter. This is to help prevent the roving "licking up"; when this is done, top clearers similar to those used on mules are used. The slubber roving is put through two processes of fly frames and made into the following hank roving: 2.25 at the first intermediate and 5 at the second for the 40s cotton, and for the 24s cotton the hank roving at each frame is as follows: 2.25 at the first and 8 at the second intermediate.

The spread of the rolls should be as follows: Front to middle, 2 inches; middle to back, 2⅛ inches. It should be understood that when giving the spread of the rolls, the distance is from centre to centre. The warp yarn is then spun into 24s on a warp frame having a 2-inch diameter ring and a 7-inch traverse. Some overseers give a little more than standard twist to this yarn. The yarn is then put through the spooler and from here to

the twister, where it is made into 2-ply yarn. From here it is put through the warper and the slasher. The filling yarns may be either mule or ring spun; if spun on a ring frame for 40s yarn, use a 1⅜-inch ring and 5½-inch traverse. This yarn is then conditioned, when it is ready to weave.

PLAIN and PLAIDED NAINSOOK

Nainsook is a light cotton fabric, utilized for numerous purposes,such as infants' clothes, women's dress goods, lingerie,half curtains for dining rooms, bathrooms and for various other purposes. The striped or plaided nainsook is used for the same purposes as the plain fabric, depending upon the tastes of the consumer. Where the fabric is required for lingerie and infants' wear, the English finished fabric is selected because of its softness. When intended for curtains or dress fabrics the French finished fabric is chosen; the latter finish consists of slightly stiffening and calendering the fabric.

The name nainsook is derived from the Hindoo Nainsukh and was orginally defined as a stout India muslin, manufactured in India.

The fabric as manufactured to-day may be distinguished from fine lawns, fine grades of batiste and fine cambrics from the fact that it has not as firm construction, or as much body, and the finished fabric is not as smooth nor as stiff, but inclines to softness, principally because it has not the body to retain the finishing materials used in finishing the fabric; consequently it must needs be a cheaper article than the fabrics above mentioned. Nainsook, like most cotton fabrics, is made in several grades, the different grades being affected by the counts of yarns used, which in turn influence the ends and picks per inch in the construction.

ANALYSIS.

Width of warp in reed, 30½ inches; width of fabric finished, 28¼ inches; ends per inch in reed, 82, reeded 2 in 1 dent; ends per inch finished, 86, ends in body, 2,460, plus 40 ends selvedge, equals 2,500, total ends in warp; take-up during weaving, 5 per cent; weight of fabric, 1½ ounces per yard; warp yarn, 1-50s cotton; filling yarn, 1-64s cotton; 66 picks per inch in loom; 68 picks per inch finished. Fig. 1, design; fig. 2, chain draft; fig. 3, drawing-in draft.

LOOM REQUIRED.

Nainsook, like various other one-filling fabrics of the character under discussion, may be woven on any light, single box, high speed loom.

Plaided nainsook seems to imply

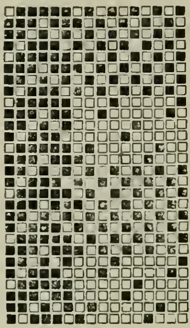


Fig. 1.

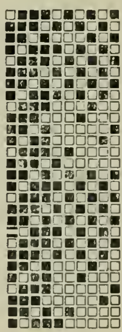


Fig. 2.

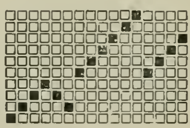


Fig. 3.

the use of more than one filling, the plaid, however, is formed by the weave. See design Fig. 1.

FINISHING.

This fabric is given either what may be termed an English or a French finish. By the former finish the fabric, after it comes from the loom, is boiled off, then bleached, after which it is softened by immersing in a light solution of glycerine, or cocoanut oil, and flour or

farina, after which it is dried by passing over heated cylinders, then run through a rotary press with very light pressure. In the French finish, after the fabric is bleached, it is stiffened by immersing in a solution of size, composed of the following ingredients: nour, wax and gelatine, after which the fabric is dried, then slightly sprinkled with water, then run through the calender, which completes the finishing process.

Carding and Spinning Particulars.

One mill making the above style of fabric makes its warp and filling yarn as described below. This mill is included in the second division as given in a previous article. Its equipment includes both combers and a bale breaker. The stock used is 1½-inch good quality Allen seed cotton. The cotton is put through three processes of picking and an opener. The opener is connected with the breaker picker. This picker is provided with a two-bladed rigid type of beater, which rotates at 1,500 revolutions per minute. The weight of the lap at the front of this beater is 40 pounds or a 16-ounce lap. These laps are put up at the intermediate picker and doubled 4 into 1. This picker is also provided with a two-bladed, rigid beater, the speed of which is 1,450 revolutions per minute. The total weight of the lap at the front of this picker is 38 pounds or a 12½-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. It is at this point that the cut roving waste is mixed in, it having first been put through a roving picker and a picker to form it into a lap.

THESE ROVING LAPS

are mixed in with the raw stock in proportion of three laps raw stock to one lap cut waste. The beater used on this picker is a two-bladed, rigid type and its speed is 1,400 revolutions per minute. This gives the cotton passing through the picker about 42 beats or blows per inch. The total weight of the lap at the front is 36 pounds or a 12½-ounce lap. The laps are next put up at the card. This card is provided with a 26-inch doffer. The speed of the licker-in is 350 revolutions per minute, flats one revolution every 43 minutes. The draft is 100. Cards are stripped three times a day, ground twice a month, and the wire fillet used is No. 34s for the cylinder and 36s for the doffer and flats. The weight of the sliver at the front of the card is 50 grains and the production is 600 pounds per week of 60 hours. This mill is equipped with 6-head, 8¾-inch lap combers.

THE SLIVER

from the card is doubled 14 into 1 at the sliver lap machine and the weight of the lap is 320 grains. These laps are put up at the ribbon lap and doubled 6 into 1, the weight per yard at the front being 275 grains. These are put up at the comber and doubled 6 into 1, the weight of the lap at the can being 40 grains per yard. The speed of the comber is 90 nips per minute and 18 per cent of waste is taken out. The sliver is then put through two processes of metallic top roll drawing frames, the weight of the sliver at the finisher drawing being 70 grains per yard. The speed of the front roll is 375 revolutions per minute. The drawing is then put up at the slubber and drawn into .55 hank roving. This is then put through three processes of fly frames and made into the following hank roving at each frame: First intermediate 1.50, second 4, and jack frame 12 hank. The bottom steel roll

SETTINGS

are as follows: Front to second, 1⅝ inches; second to back, 1¾ inches. The front top rolls of the slubber are varnished. The roving is next taken up to the ring spinning room and made into 64s for filling and 50s for warp. For spinning 50s warp yarn use a frame having 2¾-inch gauge, 1½-inch diameter ring, 6-inch traverse, and put in 31.71 turns or twists per inch. The spindle speed is 10,000 revolutions per minute. This yarn is then put through a spooler and a warper and then a slasher. The filling frame to spin 64s should have a 2¾-inch gauge, 1¼-inch diameter ring, 5-inch traverse, 27 twists per inch and a spindle speed of 7,700 revolutions per minute. This yarn is taken to the conditioning room and then it is ready to be woven.

SPOT and STRIPES

As Produced by Means of an Extra Warp.

The spot or stripe may be effected by the weave alone or by means of extra warp and filling. The latter method of constructing these fabrics will be considered. Fabrics of this character are made in a variety of qualities

—from an "all cotton" to a very fine woolen or worsted fabric. The elaboration of the spot or stripe is largely influenced by the material used in the body of the fabric. The rule with

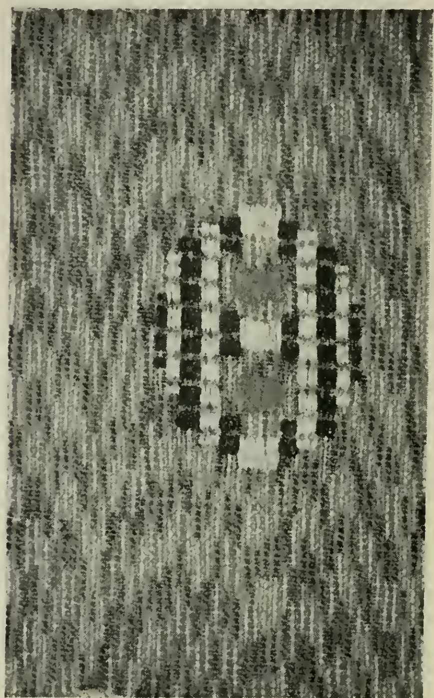


Fig. 1.

few exceptions is, the finer the quality of the material, the more elaborate is the stripe or spot.

THE SPOT PATTERN.

The spot is effected by floating the extra warp or filling yarn on the back of the goods for a given space, then raising the extra yarn to the face of the fabric for a given number of picks. The size of the spot depends on the number of picks or ends which the extra yarn floats over, which may be only one, two or more picks or ends. This, of course, is the simplest form of the spot pattern.

The simplicity of this method of construction lends itself readily to some very neat effects in small spot patterns; for example, by using different colored yarns for the spot, arranged in some order, on a ground composed of a 4x4 herringbone weave, with ground color scheme as follows: 4 ends green, 4 ends black, 4 ends brown, 4 ends black, with the same arrangement in the filling. The spot yarn may be composed of several colors, as, for instance, red, white and yellow.

In making the spot, with extra warp yarn only, the spot yarn is usually directly under the lightest ground color and forms the spot at the junction of light ground colors, referring to ground color scheme given above.

The spot yarn comes to the face of the fabric where green crosses green for two picks, then floats on back until the alternate crossing of green. This form of spot is operated on but two harnesses. The more elaborate spot is formed on the same principle as the small two-pick spot, just mentioned; the elaboration consists of the use of more ends. These ends are woven in, in the form of a figure, which requires the use of from 4 to 12 harnesses and more, in order to form the spot. These large spots are usually woven on a plain ground weave. The pattern would be read: 1 end of ground. 1 end of figure or extra yarn. The figure could be removed without affecting the ground weave, by reason of the fact that the spot is formed entirely by extra yarn. The spots are woven in the cloth in some order; for instance, they may be based on any satin, broken twill, or plain weave order.

Fig. 1 is a sample of spot pattern formed by extra warp yarn.

RAISED STRIPE PLAID.

These fabrics are much in use as a dress fabric for children and are made in all cotton, worsted and cotton, and all worsted, with the exception of the raised stripe, which is usually mercerized cotton or silk.

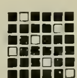


Fig. 2.

The raised stripe is formed by the use of partially extra yarn in both warp and filling, that is to say, if a stripe is formed with 12 ends, these 12 ends would be reeded so as to take the place of only .8 ground ends; for example, if ground is reeded 2 in 1 dent, the stripe is reeded 3 in 1 dent.

If we use for ground weave $\frac{1}{2}$ twill, the raised stripe must be a weave that is divisible by 3—the number of ends in the repeat of ground weave; in order to produce perfect stitching, a 6-end irregular satin would be required.

In laying out the pattern, or color

arrangement, it should be observed that the pattern is divisible by 6, and that the number of ends between the raised stripes in both warp and filling is divisible by 6, otherwise

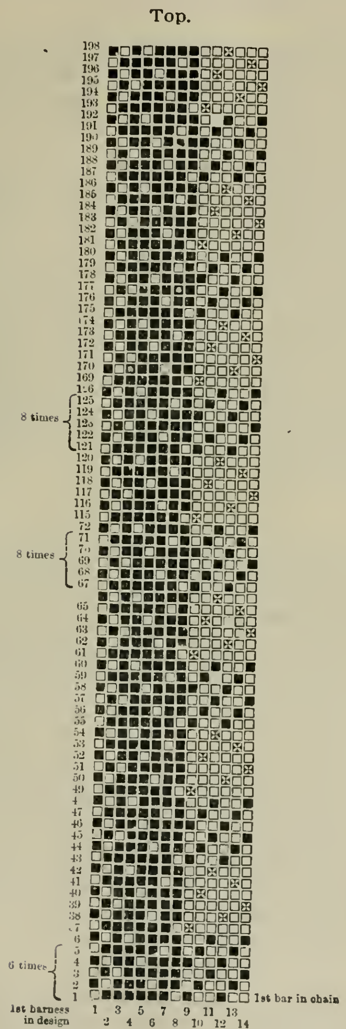


Fig. 3.

imperfect stitching will result when using a $\frac{1}{2}$ twill for ground weave.

These fabrics are made in various widths; the cotton goods are set usually at 38 inches in reed, and finish at 36 inches.

ANALYSIS.

1,000—2 reed; picks 54, with stop take-up.

WARP AND FILLING PATTERN.

36 ends bleach cotton.
4—6 ends blue cotton mercerized.
6 ends bleach.
4—6 ends blue.
6 ends bleach.
4—6 ends blue.
30 ends scarlet.
12 ends green, start 12.
4 ends black.
2 ends bleach.
4—6 ends scarlet.

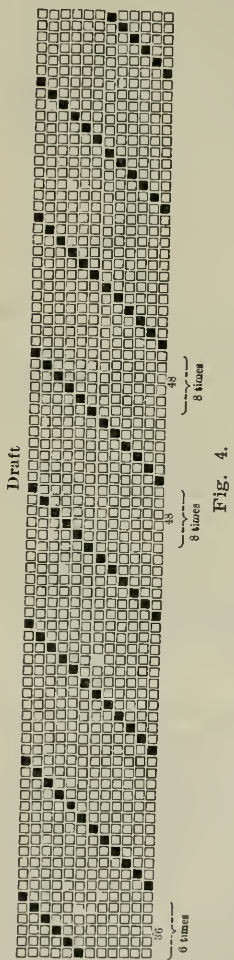


Fig. 4.

2 ends bleach.
4 ends black.
12 ends green, end 12.
30 ends scarlet.
4—6 ends blue.
6 ends bleach.
4—6 ends blue.
6 ends bleach.
4—6 ends blue.

198
14 ends extra yarn for stripe.

184

Fig. 3 required chain draft.
Fig. 4 drawing-in draft.

Ends in warp.	Ends in pattern.
708 bleach	64 2-40 cotton.
660 scarlet	60 2-40 cotton.
288 green	24 2-40 cotton.
396 blue	36 2-40 mercerized cotton.
72 scarlet	6 2-40 mercerized cotton.
144 black	8 2-40 mercerized cotton.
2,268	198 ends in 1 pattern.

2,268 total ends in warp.

The pattern shows that we have 198 ends and picks taking up the space required for 184, or 14 ends and picks of extra yarn in each pattern require average picks per inch in fabric: 54 pick wheel—198 in place of 184; 184 : 198 : : 54 : x equals 58 picks.

To calculate filling material required for 10 yards of cloth:

PATTERN.

64	A
60	B
24	C
36	D
6	E
8	F
198	
184	

38 inches in reed.
54 pick wheel.

2,052 divided by 184 = 11.15 average yards of yarn of colors in 1 yd.

11.15
10 yds.

111.50
5.58 5% added for waste.

117.08

117.08
64

	Weight of each color.
7,493.12 yds. of color A—	7.13 ozs.
7,024.80 yds. of color B—	6.66 ozs.
2,809.92 yds. of color C—	2.66 ozs.
4,214.88 yds. of color D—	4.01 ozs.
702.48 yds. of color E—	.70 ozs.
936.64 yds. of color F—	.90 ozs.
	22.06 ozs. of filling for 10 yds. of cloth.

2-40s mercerized filling = 16,800 yards to 1 lb.

LOOM REQUIRED.

These fabrics require the use of box looms; a 4x1 or 6x1, or pick and pick loom, that is, a 4x4 box loom, is much used. If 6 colors are in the warp pattern, a 6x1 box dobby loom should be used. In the cheaper grade of plaids a 6 color warp pattern is sometimes filled with only 4 colors; this necessitates that one filling color covers two warp colors. A little discretion along this line will enable the manufacturer to use a 4x1 box loom where a 6x1 should be used. This, however, is only practiced in the cheaper grade of fabrics.

FINISHING.

These fabrics, if made with worsted are given a light scouring, then pressed. In the large spot patterns the extra yarn that floats on the back, when not forming the spot, is cut off by means of a shearing machine. The cotton fabrics are usually given a dry finish—simply run through a rotary press with slightly heated cylinders, and slightly steamed before passing over the cylinder of the press—after which they are made up into small rolls, then shipped.

Carding and Spinning Particulars.

The mills making the yarn for these fabrics will be found in either the first or second division of mills, as given in a previous article.

The yarns of which this class of goods is made vary a great deal, some of the finer ones being combed. For this article we will consider the warp and filling to be carded 2-40s yarn made from a 1 5-16-inch staple peeler cotton of a good grade. The raw stock is mixed by hand, although, if done by a bale breaker, it is better, as has been before stated; especially is this true in rainy or muggy weather. The mixings should be as large as possible and the hands mixing the cotton should break the bale into as small parts as possible.

IN HAND MIXING

several bales should be opened at once, and the cotton from each mixed together. At this point the sliver waste is mixed in with the raw stock. This should be thoroughly spread over the entire mixing. The cotton is put through an opener and three processes of picking. Always keep hopper of opener more than half filled with cotton, so as to obtain as even a feed as possible.

After passing through the opener the cotton is fed on to an endless lattice, which carries it to the feed rolls of the breaker picker. These condense the cotton and present it to the action of the beater. This beater is generally the two-bladed rigid type of beater and its speed is 1,550 revolutions per minute. Look at the

GRID BARS

to see that they are properly spread and the dirt is going through them and not being drawn into the cotton again after being knocked out by the beater. Do not allow the dirt to collect under picker, especially under the grid bars, as it is liable to be drawn into the cleaned cotton by the draft. The total weight of lap at the front of the breaker is 40 pounds or a 16½-ounce lap. These laps are put up at the intermediate picker and doubled 4 into 1. This picker is also generally provided with a two-bladed rigid type of beater, whose speed is 1,500 revolu-

tions per minute. The total weight of the lap at the front of this picker is 38 pounds, or a 12½-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. It is at this point that the

CUT ROVING WASTE

is mixed in. If the mill contains a cut roving waste picker the proportion of mixing is as follows: Three laps raw stock to one lap cut roving. If, however, there is no such machine, the two centre laps are taken out and the cut roving spread evenly over the surface of the last lap. This will, of course, bring the waste between two laps of raw stock. The beater of this machine is a rigid two-bladed beater and makes 1,450 revolutions per minute, which gives the cotton passing through the machine 41½ beats per minute. The total weight of this lap at the front is 36½ pounds or a 12-ounce lap. The variation allowed for this kind of work is one-half pound either side of standard. Laps weighing over or under this variation are put back to be run over again. These laps are put up

AT THE CARD.

This card should have a draft of not less than 100. The end is set for medium work and uses the medium count of wire fillet for wiring doffer flats and cylinders. Set the doffer (which should be as large as possible) from the cylinder with a 7-1,000-inch gauge. The flats of the cards should make one complete revolution every 45 minutes. The cards should be cleaned thoroughly twice a day and the front wiped off many times more, to keep fly from falling back into good work. Strips should be collected at regular intervals which should not be so long apart as to allow the fly to accumulate so that it is liable to fall over on the doffer or be drawn up into the flats. This it cannot do if cards are equipped with a Thompson waste roll. The sliver at the front should weight 60 grains per yard and the production should be about 750 pounds for a week of 60 hours. Strip cards three times a day (twice in morning and once in afternoon) and grind all over once every three weeks.

DRAWING.

The cotton is next put through three processes of drawing frames. These frames may be equipped with leather top rolls or metallic top rolls. If the former, be sure to see that the rolls are well covered and in perfect condition and well varnished. The frames should at least receive a set of front top rolls every week. The speed of the front roll should be about 350 revolutions per minute. The frames may be equipped with metallic rolls to good advantage and, if they are, care should be taken to keep the flutes free from dirt of all kinds. The weight of the drawing sliver at the front of the finisher drawing frame should be 75 grains per yard. The cans of sliver are put up to the slubber and spun into .50 hank roving. Varnish the front loose top rolls of the slubber. The other sets of top rolls may also be varnished, but they are not so important. Keep rolls properly covered, oiled and weighted. Look out to see that no cut work is being made. After passing through the slubber the cotton is put through three processes of

FLY FRAMES

and made into the following hank roving: at each first intermediate, 1.50; second intermediate or roving frame, 4, and jack frame 10 hank. Be careful to see that proper twist is being put in, just enough so that the roving will not break back at the succeeding process. The method of finding the standard for twist has been given in a previous article. Another point is to see that the tension is right, because, if it is too much, the roving will be apt to be strained, while, if too slack, a soft bobbin will be made. Keep top leather rolls in good condition, as well as spindles well oiled for good roving. After having passed the fly frames the roving is taken to the

RING SPINNING FRAME

and spun into 40s yarn. If spun on a warp frame, use a frame having a 1⅝-inch diameter ring, 6½ inches traverse, twist per inch of 28.46, and spindle speed of 10,000 revolutions per minute. If spun on a filling frame use a frame having a 1¼-inch diameter ring, 5½-inch traverse, twist of 23.72 and spindle speed of 8,800 revolutions per minute. The yarn is next twisted into 2 ply at the twister and then the warp yarn is run on a chain warper; from here it is taken and dyed, after which it has to be warped again on a beam.

Dyeing Particulars.

Following are the dyeing particulars on cotton yarn and mercerized yarn:

SCARLET.

Four per cent direct scarlet A; 30 per cent common salt.

MAROON.

Three and one-half per cent direct maroon B; 30 per cent common salt.

PINK.

Three-quarters per cent direct pink 7 B; 20 per cent salt.

YELLOW.

Three per cent chromine G; 30 per cent salt.

GREEN.

One and one-half per cent naphtamine green 4 B; 25 per cent salt.

NAVY BLUE.

Four per cent naphtamine blue 2 B; 30 per cent salt.

LIGHT BROWN.

One-half per cent naphtamine brown N conc; ½ per cent naphtamine yellow N N conc; 20 per cent salt.

SKY BLUE.

One per cent diamine sky blue F F; 30 per cent Glauber's salt.

ORANGE.

One per cent naphtamine orange O; 30 per cent Glauber's salt.

LIGHT OLIVE.

Three-quarters per cent direct olive R; ¾ per cent naphtamine yellow N N conc; 30 per cent Glauber's salt.

BROWN.

One per cent naphtamine brown 6 B; 2 per cent naphtamine yellow N N; 30 per cent salt.

SLATE.

One and one-half per cent naphtamine black N; 20 per cent salt.

BOTTLE GREEN.

Five per cent naphtamine black 2 G; 1 per cent naphtamine yellow N N; 30 per cent salt.

BLACK.

Five per cent naphtamine black D; 30 per cent salt.

HELIOTROPE.

One-quarter per cent heliotrope B B; 20 per cent Glauber's salt.

ECRU.

One ounce naphtamine brown N; 2 ounces naphtamine yellow N N; 20 per cent salt.

TARTANS.

Tartans, also termed tartan plaids, or Scotch plaids, are highly colored fabrics, the distinguishing effect being large plaid or check effects formed by two or more colors of warp and filling, more particularly containing such prominent colors as red, yellow, blue, orange, green, purple, primary and secondary colors and other showy colors, to a greater or less degree. Pure blacks and whites are also used.

THE MATERIALS

used are yarn dyed. The weaves used are usually the plain, $\frac{2}{2}$ twill, $\frac{2}{2}$ basket, $\frac{3}{3}$ twill, $\frac{3}{3}$ basket, and rearrangements of or combinations of these weaves, which distribute the warp and filling in equal proportions on both sides while retaining a firm structure of cloth.

The Mayo or Campbell weave, Fig. 1, and the 6-end twill and 6-end basket are used for the finer grades of goods.

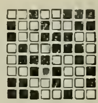


Fig. 1.

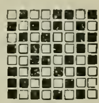


Fig. 2.

Tartans, although sometimes made with cotton yarns, are more extensively made with worsted. They are also made with other fibres.

References to tartans being used for wearing apparel are found in literature, dating back to the 15th century.

At the present time tartans are used, as of old, for ladies' dress goods, and also for a certain type of garment for men, well known where Scotchmen have found their way.

The word tartan is of doubtful origin, some historians claiming one and some another. For several hundred years it has been connected with cloths made and worn principally by people in the Scottish highlands..

The Highlanders were formerly divided into sections, or clans, each of which had its own special tartan, the latter varying in the arrangement of colors, or of the colors themselves, or of both, from those used by the other clans.

The Scottish clans and their tartans have been ably and extensively dealt with in literature, books having been

published on the subject, to which the reader is referred for more detailed information. In some of these publications the illustrations show the principal tartans in their several colors.

A collection of tartans of good quality is one of the best aids in studying pure color combinations that can be obtained.

It is said that the tartan, no matter of what colors or arrangement of colors the plaid may be composed, signifies the brotherhood of the various Scottish clans.

THE SIMPLEST FORM

of tartan is in two colors, arranged so many ends of one color and an equal number of ends of another color in the warp, the arrangement of filling being similar to the warp, making blocks of equal size.

The combinations of colors, or arrangements of yarns, may vary as desired.

From this base an infinite variety of variations can be made; 4, 5 and 6-color tartans are commonly made.

In a tartan made in six colors, red, yellow, blue, green, black and white, with the exception of the yellow and white ends, which work $\frac{7}{\;}_{1}$, the weave is as shown in Fig. 2.

A tartan with a prominent weave effect, as in this instance, is something unusual. The idea here seems to have been to get a stripe effect.

To produce said tartan, 16 harnesses would be required, 8 for the ground, 6 for the warp float and 2 for the selvedges. The sections working $\frac{7}{\;}_{1}$ work in 8-end sateen order; the largest contains 6 ends, therefore 6 harnesses only are required.

Being a fabric characterized by color effect, tartans are made to vary in quality, width, weight and finish to a considerable degree, according to requirements. In cotton goods they are usually developed in medium counts of yarn, from say 20s to 40s.

LOOM REQUIRED.

One requisite for weaving tartan fabrics is a loom with two or more shuttle boxes at one end. For almost all of the patterns a single box will answer at the other end.

The harness motion of the loom will differ according to the weave required. For a plain weave tartan, an ordinary 2-cam gingham loom will answer; in fact, about the only difference between a tartan and a gingham is that the colors of the former are brighter than those of the latter, and yarns of only one count are generally used, one warp only being required, whereas in a gingham it is quite common to have yarns of varying counts in both warp and filling.

A tartan plaid is also larger, as a rule, than a gingham check.

A cam box loom would also suffice for weaving 4-harness twill and derivative weaves, although it might be preferable in the case of the latter to use a dobby loom on account of the cross drawing-in that would be necessary.

For fancy weave tartans, which are in the minority, a box loom with a dobby head is required.

LONG CLOTH.

Long cloth is a fine cotton fabric of superior quality, made with a fine grade of cotton yarn of a medium twist. Originally, the fabric was manufactured in England and subsequently imitated in the United States.

The fabric is used exclusively for lingerie and long dresses for infants, from which it has apparently derived its name.

Long cloth to some extent resembles such fabrics as batiste, fine grades of muslin, India linen and cambrics. It is distinguished from these fabrics by the closeness of its weave and when finished, the fabric possesses a whiter appearance, due to the closeness of the weave and the soft twist yarn. The fabric, while possessing fair weaving qualities, is, however, not used as a dress fabric, chiefly because of its finished appearance which is similar in all respects to fabrics which we have been accustomed to see that are used solely for lingerie, night gowns, etc.

Long cloth, like the fabrics enumerated above, is made in a variety of grades or qualities. It is a very common thing in textile manufacturing to vary the grade of a fabric; not simply because the manufacturer loves to do so, but because of necessity, competition, etc.

THE SOLE PURPOSE

of the manufacturer is to produce a fabric that will sell and in order for a fabric to sell, it must be attractive and reasonable in price; the price which a manufacturer can command determines precisely how he must construct any fabric which he may offer to the consumer; if he finds, for instance, that long cloth is more salable at 12½ cents a yard than at 15c.,

it follows that he must make it at the former price. In order to make it profitable at 12½ cents per yard he must either use a cheaper grade of yarn or make a slightly lighter fabric, by using a fine count of yarn, which will produce more yards of cloth per pound of yarn; thus are brought about the various grades and qualities of fabrics.

The public is sometimes badly mistaken when it imagines it buys precisely the same fabric at 12½c. which some other concern is offering at 15c. per yard.

Following is an

ANALYSIS OF A FABRIC

which sells at 15c. per yard.

Width of warp in reed, including selvedges, 37½ inches. Width of fabric finished, 36 inches; ends per inch finished, 100; ends per inch in reed, 96; ends in warp without selvedges, 3,600; ends in selvedges, 40; total ends in warp, 3,640.

Take-up of warp in weaving 8 per cent; weight of finished fabric 2.5 ounces; warp all 1-50s cotton; filling all 1-60s cotton.

Picks per inch finished, 92.

Picks per inch in loom, 90.

LOOM REQUIRED.

A factor of supreme importance in the production of light cotton fabrics is the loom facilities available; such fabrics as long cloth and fabrics closely allied in character are woven most profitably on high-speed looms, such as a self-filling Northrop loom.

Long cloth is but a plain woven fab-

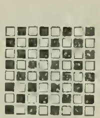


Fig. 1

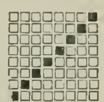


Fig. 2

ric (Fig. 1 design; Fig. 2 drawing-in draft) and is usually woven with eight harnesses, owing to the number of ends per inch, which would overcrowd the heddles and cause the yarn to chafe and break if less harnesses were used. The yarn is sized before the warp is beamed. The sizing is merely to strengthen the yarn. For light sizing it is not necessary to use anything but wheat flour, farina, or sago and a small quantity of softening material, usually tallow or wax.

FINISHING.

After the fabric is woven it is sent to the bleaching house. The first process is to boil it, then it is bleached. After the bleaching process the fabric is subjected to a very light sizing. The most prominent of the sizing ingredients is the softening material used, which may be glycerine, paraffine, cocoa oil, olive oil or bees' or Japan wax.

After the fabric is sized it is run through a rotary press, the cylinders of which are only slightly heated, with equally as little pressure on the fabric. The cloth is then folded, after which it is ready for the market.

Carding and Spinning Particulars.

The yarns for this fabric are made in the second division of mills, as given in a previous article. Long cloth is also sometimes made in the better-equipped mills of the first division. The raw stock used is generally Allen or peeler cotton, the average length of staple of which does not exceed 1⅛ inches in length. In some grades of long cloth the filling yarn is combed, but as it is the more general custom to use a carded yarn, we will work on this basis. Make the mixings as large as possible. After being mixed the cotton is put through three processes of picking and an opener. Keep the opener hopper

WELL FILLED,

so that the pin beater will always have to strike some of it back. A well-filled spiked lifting apron means an even amount of cotton being fed to the breaker picker and therefore a more even breaker lap. For this class of cotton a three-bladed rigid type of beater is best. The speed of this beater should be about 1,050 revolutions per minute, as this class of cotton is generally very dirty and requires an extra amount of beating in the breaker and intermediate pickers so as to get a good, clean lap. The weight of lap at the front of the breaker picker should be 40½ pounds. These laps are put up and doubled 4 into 1 at the intermediate picker. The beater used on this picker, to get good results, should be a two-bladed, rigid, type, the speed of which should be 1,500 revolutions per minute. The weight of the lap at the front should be 38 pounds or a 12-ounce lap. These laps are put up at the intermediate picker and doubled 4 into 1. It is at this picker that the

CUT ROVING WASTE

is mixed in in the proportion of three laps raw stock to one lap roving waste. If the mills are not provided with a roving picker, the third lap is taken out and the roving fed on top of the sheet that comes from the fourth lap. Do not use too much waste because it tends to make split laps which cause trouble in licking and making single at the card. The beater of the finisher picker is generally a two-bladed rigid type, the speed of which should be about 1,500 revolutions per minute. The total weight of the lap at the front should be 36 pounds or a 13-ounce lap. A variation of one-half pound, either standard, is allowed for this work. The cotton passing through the finisher picker receives 42 beats or blows per inch. Put these laps up

AT THE CARD

which should have wire fillet for spinning medium counts of yarn. The draft of this machine should not exceed 115. The speed of the licker-in is 375 revolutions per minute and the flats make one complete revolution every 50 minutes. The percentage of waste and fly taken out is about 3.75 to 4. Use medium settings and be sure that the feed plate is not set too close so as to break the staple. The cards should be stripped as follows: Three times for cylinders and four for doffers per day. Grind cards all over at least once every three weeks, lightly, and set after having ground. The weight of the sliver at the front should be 60 grains per yard. The production on this class of goods should be 700 to 750 pounds per week of 60 hours. This sliver is put through three processes of drawing frames which may be either equipped with metallic or leather-covered top rolls. If leather top rolls are used a good receipt for

VARNISH,

which differs from those already given, follows: 8 ounces best flake glue, 8 ounces ground or flake gelatine, 3 pints acetic acid, 1 pound burnt or raw sienna, 1 ounce oil of origanum. In many mills trouble is often found with the laps of the leather rolls breaking or splitting apart when varnish is first put on. If the laps are painted with formaldehyde, using a fine brush for the purpose, it will be found to overcome this trouble. This not only applies to drawing frame top leather rolls but to all leather rolls that have to be varnished.

ANOTHER POINT

to look out for is when sending rolls away to be covered, all waste should be removed from the bearings, for, if this is not done, a rust spot will be on them when they are returned from the roll coverer. On the drawing frame on this class of work it will be found advantageous to use metallic top rolls. If used, keep the flutes clean and smooth. The speed of the front roll should be 375 revolutions per minute on all processes. The doublings are 6 into 1 and the weight of sliver at the front is 70 grains per yard. Size the drawing frames at least three times a day. The sliver is next put up at the slubber and made into .55 hank roving. From here it is put through three processes of fly frames and made into 11.50 hank roving at the jack frames. The hank roving at the different processes is as follows: First, 1.50; second, 4 and fine 11.50. From here it is taken to the ring spinning room and spun into 50s yarn on a warp frame having a 2¾-inch gauge, 1½-inch diameter ring, 6-inch traverse, 31.81 twist per inch and a spindle speed of 10,000 revolutions per minute. From here it is spooled and warped and the required number of beams put up at the slasher to give sufficient end for the warp at the front. A good slasher size is as follows: Water, 100 gallons; potato starch, 65 pounds; tallow, 6 pounds; Yorkshire gum, three pounds; soap (white) two pounds. Boil 1¾ hours.

For the filling yarn the roving is spun into 60s on a frame having 2¾-inch gauge, 1¼ diameter ring, 5-inch traverse, 27 twist per inch and spindle speed of 8,000 revolutions per minute. This yarn should be conditioned.

BUCKRAM.

Buckram may be described as a coarse, glue-sized fabric made with cotton, linen, hemp or cotton and hair, the name in most cases being acquired by the finish which the fabric receives after it is woven. Some qualities of buckram are but plain woven cotton fabrics.

Buckram is used principally for stiffening garments, being much in demand by tailors, who use the fabric for stiffening and to give shape or form to a garment. The fabric is inserted between the lining and the surface cloth of the garment in particular parts, such as the lapel, cuff or wherever the

shape of the garment is essential to its appearance. Buckram is manufactured in several kinds; the fabric used for men's wear is usually made with linen, hemp or hair and cotton; the latter combination, namely, hair and cotton, is supposed to be the best, insofar that when bent or twisted it will spring back to its original position; this feature cannot be attributed to hemp or linen. The hair and cotton buckram is a loosely woven fabric, the hair figuring as warp, and the cotton as filling. It is usually woven in plain twills or herring-bone weave. The

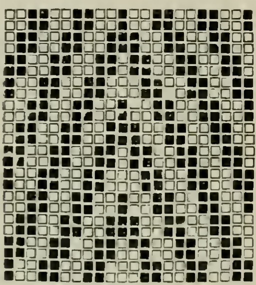


Fig. 1.

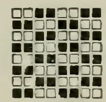


Fig. 2.

filling is usually two picks in one shed. (See Fig. 1, design.)

Buckram also figures largely in the millinery trade, where it is made up into hats. These hats are covered with chenille, plumes, flowers or whatever finery may be desired.

The buckram used for this purpose is a plain woven cotton fabric heavily sized, increasing its weight from 50 per cent to 100 per cent. The odd feature of millinery buckram is that two separate fabrics are made into one during the finishing process by means of gluing or sizing them together; these two fabrics are of different texture. The top or face fabric closely resembles a fine cotton voile, while the back or bottom fabric might be termed a coarse tarlton.

Millinery buckram is a piece-dyed fabric, usually in sombre colors, such as dark red, garnet, dark green and black. In the hair and cotton fabric, which is principally used for men's wear, the cotton is dyed before it is woven.

COTTON BUCKRAM ANALYSIS.

Face or top fabric: Width of warp in reed, 38 inches; width of fabric finished, 36 inches; ends per inch finished, 40; ends per inch in reed, 38; ends in warp, 1,440; 19x2 reed; take-up of warp during weaving, 8 per cent; warp, 1-22s cotton; filling, 1-26s cotton; 34 picks per inch; weight from loom, 2.22 ounces.

Back or bottom fabric: Width of warp in reed, 41 inches; width of fabric finished, 36 inches; ends per inch finished, 16; ends per inch in reed, 14; ends in warp, 576; ends selvedge, 24; total ends in warp, 600; 14x1 reed; take-up of warp during weaving, 5 per cent; warp, 1-12s cotton; filling, 1-10s cotton; 12 picks per inch; weight of fabric from loom, 1.86 ounces.

Weight of two fabrics after finishing, as one, 6.38 ounces; nearly 60 per cent added by sizing materials.

LOOM REQUIRED.

These fabrics may be woven on any light-built loom, the speed of which should be from 150 to 170 picks per minute. The warp for face fabric is usually drawn on eight harnesses; the back fabric may be drawn in on four harnesses in the order of: 1, 3, 2, 4. The chain, if a dobby loom is used, must be built accordingly. (Fig. 2.) Chain required: 2 repeats.

FINISHING.

These fabrics, as previously mentioned, depend a great deal on the finishing which they receive. The men's wear buckram requires less sizing by reason of the strenuous ordeal to which it is subjected in the fulfillment of its purposes, and also because the warp, which is composed of hair, is in itself quite stiff.

Millinery buckram requires more attention. After the fabrics are woven, they are dyed; the finisher then must observe that the fabrics finish the same width, so that when sized or glued together one fabric will not extend beyond the other. To insure that the fabrics lie evenly, they are stitched at the selvedges by means of a sewing machine.

The fabrics are then subjected to the sizing process, with the back cloth to the roller, which revolves in the size; this allows the size to penetrate more readily, as the meshes of the back cloth are larger than the meshes of face fabric; the fabric is usually subjected two or three times in succession before it is finally dried.

The ingredients used in sizing are glue, flour and China clay. These ingredients are used in various proportions, the following being an example: 40 parts glue, 20 parts clay, 40 parts flour.

Carding and Spinning Particulars.

The yarns which make up buckram vary according to the quality of fabric, but, generally speaking, the yarns are what are called coarse. The yarns of this class of goods would be made in mills of the first division as given in a previous lesson. In coarse yarns quantity is the end sought for rather than quality. Of course, this does not mean that everything is dropped for quantity, but that as great a production as possible is made at each machine and still get the desired quality for the class of goods being made. In fact, the machines are set to produce this result. For this article we will consider the buckram to be what is called "cotton buckram" and made up of all cotton yarn. Other kinds of buckram are made which have only one or both filling and warp back yarns of cotton fibre. The latter are made up of very coarse counts of yarns, generally about 1-10s. Cotton buckram is made up of finer yarns and for this article we will consider the count to be 1-22s for the warp and 1-26s for the filling yarns. Both these yarns are made up of the same staple cotton, generally a low grade of American cotton being used of about three-quarters-inch staple.

MIXINGS.

Waste is sometimes mixed with the raw stock, but we will consider that only good sliver waste is to be mixed with the raw stock. Large mixings are made by hand, generally enough to last a week or longer if the mixing bin is large enough. Mixing is done in the same manner as in the case of finer grades of cotton, making as uniform a mixing as possible, so that all the bales of cotton used will be distributed throughout the mixing. For this class of goods an opener and three processes of picking are used. The speed of the breaker picker, which generally has three blades and is of a rigid type, is 1,550 revolutions per minute. The total weight of the lap at the front is 40 pounds or a 16-ounce lap. These laps are doubled four into one at the intermediate picker. This picker is provided with a two-bladed rigid type of beater, the speed of which is 1,550 revolutions per minute. The total weight of the lap at the front is 39 pounds or a 14-ounce lap. The laps from the intermediate picker are put up at the finisher picker and doubled four into one. This picker is also provided with a two-bladed beater of a rigid type, the speed of which is 1,500 revolutions per minute. Great care should be taken to see that the cotton mixing is free from all foreign substances, for, if the beaters should strike any hard substances while going at this rate of speed, a spark is sure to be struck, which may cause considerable damage. The total weight of the laps at the finisher picker is 38 pounds, or a 14-ounce lap. A variation of 10 ounces either side of the standard weight is allowed for this class of goods; all laps varying more than this are run through the finisher picker again.

THE CARD.

The laps are put up at the card, which is covered with a coarse wire fillet on doffer, flats and cylinder, the wire on the cylinder being gauged coarser than that used for the doffer and top flats. The draft of the card should not exceed 85 and the speed of the flats should be one complete revolution in 60 minutes on a 110 top flat card. The cards should be stripped four times a day and ground once a month. For this class of work look out for the doffer comb to see that it is set right and is making the correct number of vibrations to clean the doffer. The production of the card is 900 pounds or even 975 pounds for a week of 60 hours with a 70-grain sliver. The sliver is put through two processes of drawing frames.

THE DRAWING FRAMES

for this class of work are generally, although not always, equipped with metallic top rolls. Keep the flutes cleaned and the rolls well oiled. If leather top rolls are used, keep them well varnished, using a little heavier varnish than the recipe given in the article on long cloth. The weight of the sliver at the finisher drawing is 75 grains per yard. The doublings at the drawings are 8 into 1. This sliver is put through the slubber and made into .40 hank roving. This is then put through two processes of fly frames. At the first it is made into 1.00 hank roving and at the second 2.50 hank. Look out to see that the full bobbins are properly shaped and that the frames are changing right, so that the roving will not run over or under, as this will make a great deal of unnecessary waste. The roving is taken to the

RING SPINNING ROOM

and spun into 22s warp yarn on a frame with a 2¾-inch traverse, 2-inch

28", 7yd, 64x64, 280.360.
300.380.
28", 6.44yd, 64x64, 280.320.

diameter ring, 7-inch traverse, 22.28 twist per inch and spindle speed of 9,500 revolutions per minute. This yarn is spooled and warped and these beams put up behind a slasher and sized and run on a beam at the front on which the required number of ends are run. The filling yarn is spun into 26s on a frame having 2¾-inch gauge, 1⅝-inch diameter ring, 6-inch traverse, 17.84 twist per inch (3.25 x square root of count) and a spindle speed of 8,000 revolutions per minute.

Dyeing Particulars.

The goods are piece dyed on the jigs or padding machines with one-dip colors.

BLACK.

5 per cent oxydiamine black A K; 30 per cent Glauber's salt; 3 per cent sal soda.

Navy blues are also dyed in the same manner. The goods are very heavily starched with dextrine or animal glues of various kinds. The goods are run through a starch mangle, or starched by hand in a tub, and dried on a tenter frame. The staroh-ing process is repeated until a sufficient stiffness is obtained.

STARCH SOLUTION.

1 gallon water, 10 ounces dextrine, mixed cold and boiled for one hour. The addition of a little color, to color the starch, is sometimes required.

INDIGO PRINTS.

Indigo print cloth is one of the standard types of cotton fabrics that are run with more or less success all the time, no matter what the trend of fashion or style may be.

An indigo print is distinguished from a regular print by having a printed figure, of any desirable type or design, on a solid indigo blue ground, the latter varying in depth of shade, according to requirements, whereas the ground of an ordinary print cloth pattern is white or a light color.

An indigo print pattern is obtained by one of

THREE METHODS:

indigo blotch printing, indigo discharge printing or indigo resist printing.

The basis of an indigo print may be any of the many types of plain cotton fabrics, according to weight and fineness desired, although what is known as a standard print cloth is generally used.

A "STANDARD PRINT"

is supposed to be constructed as follows: 28s warp, 36s filling, 28 inches wide, 64 ends and 64 picks per inch, 7 yards per pound.

28 inches x 64 ends per inch equals 1,792 ends in the warp, not allowing extras for selvedges.

As a matter of fact, a great many so-called standard prints made in Fall River, the centre of the print cloth industry, contain only 1,720 ends in the warp and 62 picks per inch in the filling.

IN NEW BEDFORD

print cloths are made from yarns two numbers finer than the above, being made of 30s warp and 38s filling. There are 1,790 ends in the warp and 62 or 63 picks per inch in the filling.

Another print cloth made in Fall River is 28 inches wide and contains 28s warp, 32s filling, 64x64 (shy). The weight is 6.44 yards per pound.

Although 28 inches is the usual width of these goods, they are also made in

OTHER WIDTHS,

generally wider. A certain wide Fall River print is constructed as follows: 34s warp, 36s filling, 46 inches wide, 56 ends and 52 picks per inch, 5.4 yards per pound.

On account of the large number of standard print fabrics used, by far the largest quantity of any type of cotton fabric made, many mills are run on these goods entirely.

THE LOOM REQUIRED

for weaving print cloths is of the ordinary plain 2-harness cam type. From a general consideration of the subject it would appear that the automatic looms would be the most economical to use.

With a plain loom the drawing-in and reeding plans are similar to those previously explained when considering other plain weave goods—skip shaft, draw on two twine harnesses, which is equal to 4 wire heddle harnesses, reed 2 ends per dent; selvedge end, double.

In consequence of the colors or design of a print cloth being the principal salable features of the cloth, and those that appear to the eye the most readily, more attention is paid to quantity than quality when weaving them. the idea being that the printing and

finishing processes will obliterate, or at least reduce, any cloth structural defects that may be made in the loom. Cloth defects are allowed to pass for prints that would not be allowed, only as second quality goods, to be finished by any of the other cotton finishing processes.

Carding and Spinning Particulars.

The mills which make yarn used for print cloth comprise the larger percentage of all the mills and would belong to the first division of mills, as given in a previous article. While the equipment of machinery is about the same in all mills making yarns for print cloth, still they differ in a great many cases as to the number of processes used. For example, one mill uses two processes of drawing and an extra process of fly frames; another may use a railway head and cut out one process of drawing, some mills using this machine before the drawing frame and some after. Some mills may only use two processes of pickers and an opener, whereas other mills use three processes.

ANOTHER FEATURE

about mills making print cloth yarns is that there is very little if any changing, according to the usual custom; as one overseer puts it, one set of gears is nailed on when the machine is started and left on until worn out, when another set of the same number of teeth is substituted for the old ones. In this article it will be the general machines and number of processes which will be given, for carding and spinning the standard print yarns, 28s warp and 36s filling. First comes the mixing, which may be done either by hand or by machine (bale breaker). The usual methods that have been explained in previous articles may be followed. Next the sliver waste from the different processes up to the slubber is mixed in at the bins or is sometimes placed in the hopper of the feeder and fed to it a little at a time along with the raw stock.

PICKERS.

After passing the opener the cotton is put through three processes of pickers, the beaters used on all three being generally the two-bladed rigid type. The speed of these beaters at the different processes is as follows: Breaker. 1,500 revolutions per minute, intermediate and finishers, 1,450 revolutions per minute. The beats per inch at the finisher picker should be 40 to 43 for this staple cotton. The total weight of the laps is as follows: Breaker, 40 pounds or a 16-ounce lap; intermediate, 38 pounds or a 10-ounce lap; finisher, 39 pounds or a 14½-ounce lap.

A variation from the total standard weight of the lap of half a pound either side is allowed. All laps weighing more or less are run through the finisher picker again. The doublings at the last two processes are 4 into 1. Mix cut roving waste at finisher process.

THE CARDS

are set for coarse work and while there are still many of the old-style American cards in use, for this article the newer card or the English card is much used, particulars of which will be given. The speed of the cylinder is 160 to 165 revolutions per minute; the licker-in, 350 revolutions per minute. The feed plate should be set to the licker-in one-eighth inch longer than the staple of the cotton, i.e., from bite of feed roll to licker-in teeth, and the feed plate should have a fairly pointed nose. The licker-in should be set with a 10-1,000ths inch gauge from cylinder wire. The back side of cylinder screen should be set 1-32d of an inch away from cylinder wire, directly underneath (in centre), with a 28-1,000ths inch gauge and at the front one-quarter inch away from cylinder wire. The doffer should be set to the cylinder loose to a 5-1,000ths inch gauge; the doffer comb set with a 12-1,000ths inch gauge from doffer wire; the top flats to cylinder wire with a 10-1,000ths inch gauge and the back and front knife plates should be set the same as for leno cotton fabrics. The top flats make one complete revolution every 45 minutes. Strip three times a day and grind as before stated. The production for a week of 60 hours is 750 to 850 pounds. The weight of the sliver is 65 grains per yard. This sliver is next put through three processes of

DRAWING FRAMES,

the speed of the front roll being 400 revolutions per minute. Use either metallic or leather-covered top rolls. The advantages of both kinds have been given previously. The weight per yard of the drawing is 70 grains. The doublings at each process are 6 into 1. At the slubber the drawing sliver is made into .55 hank roving. The top rolls for this staple of cotton are not generally varnished. The slubber roving is next put through two processes of fly frames. At the different processes the hank roving is as follows: First, 2 hank; and second 7

hank for the warp yarn. The different processes up to the last fly frame for making 36s filling yarn are the same. Here the roving is spun into 8.50 hank. The yarn is then taken to

THE SPINNING ROOM

and made into 28s warp yarn on a frame with a 6½-inch traverse, 2¾-inch gauge, 1¾-inch diameter ring, 25.-13 twist per inch, and 9,700 revolutions per minute of spindle. This yarn is spooled and warped and then put through a slasher. A

GOOD SLASHER MIXING

to use, if prints are to be woven on a common loom, is as follows: Water, 100 gallons; cornstarch, 50 pounds; tallow, 3 pounds; turpentine, 1 gill; boil 30 minutes. If woven on a Draper loom, use the following size: Water, 100 gallons; potato starch, 50 pounds; tallow, 3 pounds; turpentine, 1 gill; and boil 30 minutes. The roving for filling yarn may be either mule or frame spun. It is the general custom to have it ring spun in mills built lately. For this count of yarn use a frame with a 5½-inch traverse, 1⅝-inch diameter ring, 22.50 twist per inch, 8,900 revolutions per minute of spindle. This yarn, after being conditioned, is ready for use.

Dyeing Particulars.

The pieces are first bleached to get a good white, and then dyed in the continuous vat.

THE HYDROSULPHITE VAT.

The water is corrected by the addition of one quart of hydrosulphite to every 250 gallons of water. A stock liquor is made up in a barrel:

Fifty pounds synthetic indigo paste; 2½ gallons warm water; 3¾ gallons caustic soda, 76 degrees Tw., and stirred; temperature is raised to 105 degrees F., and 8 gallons of hydrosulphite added. The temperature is kept at about 105 degrees F. for two hours. If the solution is not clear yellow, a further addition of one gallon of hydrosulphite is made. The vat is made up from the stock liquor and the pieces are passed through a sufficient number of times till the required shade is obtained.

The pieces are washed and dried and printed with a discharge paste.

WHITE DISCHARGE.

Four and one-half pounds bichromate of potash; 9 pints hot water; 1½ pounds soda calc, then 6½ pounds No. 11 gum; 5 pints water; heated to 140 degrees F., cooled and strained.

COLORED DISCHARGE.

Eight pounds discharge pigment; 10 pounds discharge thickening; 7½ pounds tragacanth, 8 ounces to gallon.

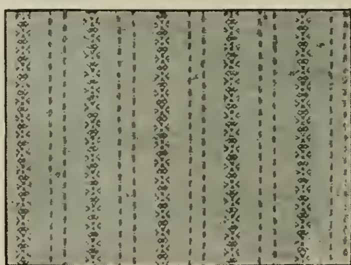
DISCHARGE THICKENING.

Eight pounds tragacenth, 8 ounces to gallon; 2½ pounds bichromate potash; 3¼ pints hot water; after dissolving add 20 ounces ammonia, 25 per cent; when cold add 1 gallon blood albumen, 8 pounds to gallon; after printing and drying, the material is passed through the following acid bath at 140 degrees F.; 4 pounds sulphuric acid,168 degrees Tw.; 4 pounds oxalic acid; 10 gallons water. The goods should be immediately well washed and dried.

LENO COTTON FABRICS.

Leno fabrics constitute a division of textile fabrics characterized by particular warp threads crossing over one or more warp threads, instead of lying parallel to one another as in ordinary or plain weaving.

These fabrics possess two distinct sets of warp threads, the regular or



ground warp and the douping warp or warp that crosses over the ground warp and forms the ornamental feature that characterizes the fabric.

Leno fabrics are woven upon a system quite apart from ordinary or plain weaving.

THE DIFFERENCE

lies chiefly in the fact that two sets of harnesses are required to operate the warp, the ground harness and the doup harness set.

The ground harness is the same as in ordinary weaving; the doup harness set consists of two harness frames, if string doup is used, known as the

standard and skeleton harness. When wire douping heddles are used, it requires three harness frames. We will for convenience deal with the string doup; this douping heddle is but a half heddle, so to speak. This half heddle is usually fastened at the bot-

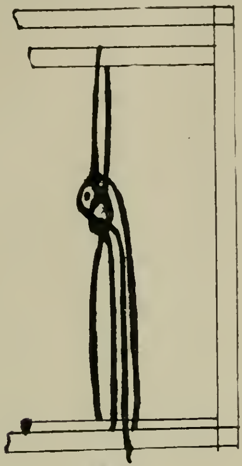
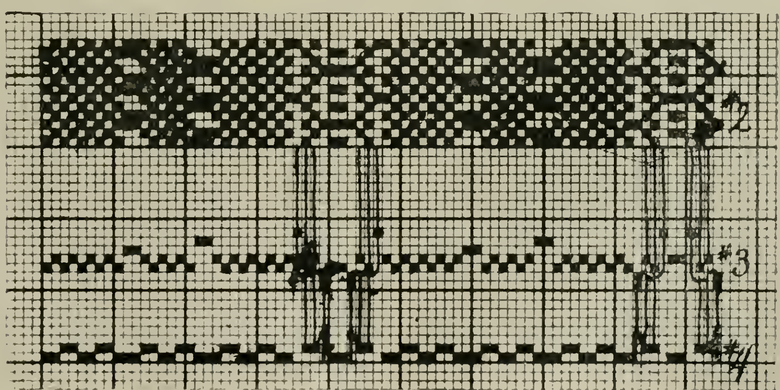
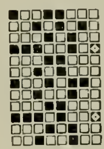


Fig. 1.

tom of the skeleton harness frame and connected with the stand and harness heddle by passing through the upper opening of the standard heddle, then through the eye of the standard heddle, then fastened at the bottom of the skeleton harness frame.



(See Fig. 1.) The secret of leno weaving will be readily understood if it is borne in mind that it consists of but two movements of the standard and douping heddles; these two movements are that if the standard and doup heddles are raised at the same time,the douping thread will be on one side of the ground warp threads, that is, it will cross under the ground threads; if, however, only the doup heddles are raised, the douping thread will remain in its normal position; that is, it will not cross under the ground threads. We must, however, bear in mind that in no case can the standard heddle be raised without also raising the doup heddle; when the standard and doup are raised together, we must also slacken or ease up on the doup warp threads in order to allow them to cross under the ground warp threads. This is done by means of a



Slackener

Fig. 5.

slackener or easing rod. This rod is similar to what is known as the whip roller in ordinary weaving. The doup threads pass under this rod into the eye of the doup; this rod is so arranged that it will let up or relieve all tension from doup threads by moving toward the loom. When doup threads are required to cross under ground warp threads the easing up of the doup threads must be indicated on chain draft. (See Fig. 5.)

Fig. 3 shows drawing-in plan. Fig. 4 reeding plan. All leno fabrics have special reeding plans; the reed is sometimes plucked, that is, a wire taken out of reed, so as not to overcrowd the threads. This is usually done when doup threads cross under six or more ground threads; the doup thread must be in same dent with the ground threads under which it crosses.

ANALYSIS.

1,400 reed special denting; 70 picks per inch; 38 inches in reed. Finished 36 inches.

WARP.

9 white.
2 medium blue.
6 white.
2 medium blue.
9 white.
2 dark blue.
1 white—2-ply.
2 dark blue.
1 white—2-ply.
2 dark blue.
—
36

As the warp lay out is on 36 ends the cloth contains two repeats of the same to one repeat of the weave.

Draw the 2-ply yarn from the top beam.

FILLING.

20 white 1-50s.

Pins.	Ends.
559 Black	48 1-40s.
233 Dark blue	20 1-40s.
56 Black	4 2-40s.
—	
848 Pins, including selvedges.	Selvedges 2-40s black.

Take-up during weaving ground warp 10 per cent.

Take-up during weaving doup warp 65 per cent.

LOOM REQUIRED.

These fabrics are usually woven on a dobby loom, the speed of which is from 120 to 130 picks per minute; a higher speeded loom usually causes considerable trouble with the doup warp.

The loom must necessarily carry two warp beams, ground warp and doup warp beams. Great care should be given to the setting of the harnesses as they should be perfectly even and form a perfect shed when in operation.

FINISHING.

These fabrics are principally used for shirts and shirtwaistings. This requires that the patterns be not too large and that the warp stripe be more prominent than the filling stripe when fabric is made with filling stripe; leno fabrics are principally yarn dyed fabrics. After the fabric leaves the loom it is boiled off, then given a light sizing, pressed, then made up into rolls, after which it is ready for the merchant.

Carding and Spinning Particulars.

Leno fabrics, like all fabrics having a trade name covering a certain class of goods, are made up of various counts of yarn and of course the methods used in making the different counts vary as to the processes used, also the kind and staple of cotton and the speed and setting of the different parts of the machines. A great many times changing the speed or setting of one part of a machine may improve the unevenness of the yarn or roving, or, if made at the picker, stop licking, so that it is very hard or almost impossible to give a hard and fast rule of speed or settings for the machines that will cover the whole of leno fabrics. The particulars which are given may be taken

AS A FOUNDATION

from which to work and a little variation one way or the other only will be needed. For an example of leno yarns, we will consider the fabric to be made up of 1-40s and 2-40s warp and 1-50s filling yarns. For these counts of yarn the equipment of the second division of mills will be needed. The cotton generally used is Allen seed or peeler (American cotton) of 1⅜-inch staple. Some mills comb both warp and filling yarns, while other mills comb only the filling yarns. In this article we will consider that only the filling yarn is to be combed, although, if both are combed, the particulars given below may be used. The mixing is made as has been previously described, it being pointed out that the use of a bale breaker in connection with a blower will help the cotton to a great extent. An opener and

TWO PROCESSES OF PICKING

are used. The sliver waste from all the machines up to the slubber is mixed in at the bins. At the opener use the particulars that have been given in previous articles. The breaker picker has a two-bladed rigid type of beater, and the speed of the beater is 1,450 revolutions per minute. Care should be taken to clean all seeds, etc., from under the bars at regular and frequent intervals. The total weight of the lap at the front of this picker is 38 pounds, or a 13-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. The speed of the beater of this machine is 1,450 revolutions per minute; the fan speed being 1,100 revolutions per minute; the driving shaft of the picker making 375 revolutions per minute. Cut roving waste is mixed in at the finisher picker in the proportion of 1 lap cut waste to 3 laps raw stock, the cut roving having been treated as described in previous articles. The total weight of the lap at the front end of the finisher picker should be 35 pounds or a 12½-ounce lap. The laps are put up

AT THE CARD,

the draft of which should not be less

than 100. The wire fillet generally used for this class of goods is 34s on cylinder and 35s on doffer and top flats. Set feed plate from licker-in with 20-1,000ths of an inch gauge; licker knives from licker-in 12-1,000ths of an inch; cylinder under screen from cylinder 22-1,000ths inch in centre and one-quarter of an inch at each end of screen; top flats from cylinder, with a 12-1,000ths inch gauge, licker-in from cylinder with a 1-1,000th of an inch gauge, doffer from cylinder with 7-1,000ths of an inch gauge. Always set to high places. Set the back edge of the back plate knife 17-1,000ths of an inch from the cylinder. The front plate knife has its upper edge adjustable in order that the amount of stripping to be taken from the flats may be regulated. Setting this plate closer to cylinder

MAKES LIGHTER STRIPPING,

and the farther away it is set, the heavier stripping it produces. The lower edge of this plate is set to a 17-1,000ths of an inch gauge. Grind and strip card as previously described. The top flats should make one complete revolution every 45 minutes. The percentage of waste taken out at the card for this class of goods should be about 4½ to 4¾. The production for a week of 60 hours is 700 pounds with a 65 grain sliver. Use a large diameter doffer. The sliver for the filling yarn is taken to the sliver lap machine and doubled 14 into 1 for an 8¾-inch lap or 20 into 1 for a 10-inch lap. The weight of the lap at the front is 300 grains. These laps are put up at the ribbon lap machine and doubled 6 into 1. The weight of a lap at the front end of a ribbon lap machine is 260 grains per yard for an 8¾-inch lap. Get weight for a 10-inch lap by proportion. Size both ribbon and sliver lap machines once a day.

THE DOUBLINGS

at the comber depend on the number of heads of the machine; recent machines are generally provided with eight heads with a 10-inch lap. The speed of the comber for this class of stock is 85 nips per minute for old machines and 100 nips for those of recent construction. Varnish rolls once a week, using one of the recipes given in previous articles; in sticky or dog-day weather use a little ground charcoal and gum arabic dissolved in a teaspoonful of vinegar. This swells to five times its bulk. Take out 18 per cent waste. After passing the combers, the sliver is put through two processes of drawing, being doubled 6 into 1. The speed of the front roll at each process is 350 revolutions per minute. The weight of the sliver at the finisher drawing is 70 grains per yard. The card sliver for the warp yarn is put through three processes of drawing, the speed of the front roll being 380 revolutions per minute. The weight of this sliver is also 70 grains per yard. The sliver is next put up at the slubber and made into .55 hank roving. From here it is put through three processes of

FLY FRAMES,

the hank roving at each process being as follows: First intermediate, 1.50; second, 4, and jack, 12. Keep your leather rolls in good condition and see that all parts of machine are well oiled and that top and bottom rolls are properly set, which for this length of staple should be for fly frames as follows: Front roll to middle, 1½ inches; middle roll to back, 1⅝ inches. From here the roving is taken to the spinning room, although some prefer mule spun yarn. There is a great difference in the opinion of mill men as to the advantages and disadvantages of both systems, one mill building with no mules and another including them in its equipment. We will consider both yarns to be

FRAME SPUN.

For a warp frame spinning 40s use a frame having a 2¾-inch gauge, 1⅝-inch diameter ring, 6½-inch traverse, 28.46 twist per inch, 10,000 revolutions per minute of spindles. The 1-40s warp yarn is spooled, warped and put through the slasher, a good mixing for which has been previously given. The 2-40s yarn is put through a twisting frame and spooled. Enough spools are put up at the warper and the ends, after which run on to a specially constructed beam.

For the filling yarn 1-50s, use a ring frame having a 2¾-inch gauge, 1¼-inch diameter ring, 5½-inch traverse, 26.52 twist and spindle speed of 8,200 revolutions per minute. This yarn is conditioned and then is ready to be woven.

Dyeing Particulars for Yarn.

BLACK.

Ten per cent immedial black N N; 10 per cent sulphide sodium; 3 per cent soda ash; 30 per cent Glauber's.

LIGHT BLUE.

Three per cent diamine sky blue F F; 3 per cent sal soda; 30 per cent Glauber's salt.

LIGHT SLATE.

One per cent diamine black; B. H; 1

ounce diamine fast yellow A; 1 per cent sal soda; 20 per cent Glauber's.

LIGHT BROWN.

One-half per cent naphtamine brown 6 B; 1 per cent naphtamine yellow N N; 1 per cent sal soda; 30 per cent Glauber's.

MEDIUM GREEN.

Six per cent thion green G; 2 per cent thion yellow G; 8 per cent sulphide sodium; 3 per cent soda ash; 30 per cent Glauber's.

MEDIUM BROWN.

Three per cent tetrazo dark brown; 1 per cent sal soda; 20 per cent salt.

MEDIUM SLATE.

One per cent tetrazo black G; 1 per cent sal soda; 25 per cent salt.

WINE.

Three per cent tetrazo Corinth; 1 per cent sal soda; 25 per cent salt.

RED.

Three per cent benzo fast red 4 B; 1 per cent sal soda; 25 per cent Glauber's.

DARK GREEN.

Seven per cent thion green B; 8 per cent sulphide soda; 3 per cent soda ash; 30 per cent Glauber's salt.

ECRU.

One per cent thion brown G; 1 per cent sulphide soda; 2 per cent soda ash; 20 per cent Glauber's salt.

FAWN BROWN.

One per cent diamine fast yellow A; 2 per cent diamine brown M; 1 per cent sal soda; 20 per cent salt.

NAVY BLUE.

Five per cent diamine dark blue B; 2 per cent sal soda; 30 per cent Glauber's salt.

BEDSPREADS---Crochet Quilts.

Bedspreads, also termed bed quilts, coverlets and counterpanes, are, as the names imply, used as coverings for bed clothing.

Being primarily decorative fabrics, most of them show elaborate jacquard designs of a type peculiar to this class of fabric, the use to which they are subjected necessitating a design of a large, bold character that is complete in itself in each quilt.

Quilts are of various sizes, ranging from crib quilts, 28x63 inches, to large quilts, 92x108 inches.

For metal beds the quilts are sometimes cut at the four corners so they will hang better and make a neater appearance.

Being a type of fabric of universal use in civilized countries, for all classes of people, quilts are necessarily made in widely varying qualities. They are also made in varying single and compound structures of cloth, and in varying types of designs.

THREE PRINCIPAL TYPES.

Three of the principal types of structures are seen in quilts known as crochet, Marseilles and satin. The first is a single fabric, where all yarns used show on one side or the other.

The second is a compound fabric, in

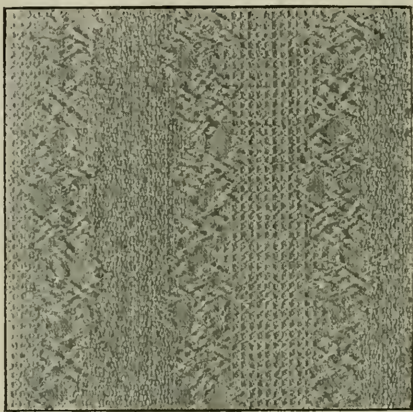


Fig. 1.

which the extra yarns are generally used for the purpose of adding weight and at the same time producing an embossed pattern on the face.

The third is a double cloth, reversible, with some types of designs in which each of the single cloths alternate from one side of the quilt to the other, according to the pattern required.

These three types will be considered in the above order.

It may be mentioned here that there are other names of quilts, as Toilet, Albany, Mitcheline, Duree, Grecian, Embroidery, Tapestry, Kensington, Alhambra and Honeycomb, but these may be included in one or other of the three principal types mentioned.

CROCHET QUILTS.

The term crochet quilt does not mean that said fabric is crocheted with needles, but refers to the simplest type of woven single cloth quilt made

with medium or fine counts of yarns. Honeycomb and Alhambra quilts are of the same class, differing principally in the type of design used.

This class of quilt, for full size quilts, shows variations in size from about 68x82 inches to 80x90 inches, and in weight from about one pound 12 ounces to three pounds 9 ounces, per quilt.

THE ANALYSIS

of an unbleached crochet crib quilt shows the following data: Width, 31 inches; 84 ends and 72 picks per inch; 24s warp, 12s soft twisted filling. The warp contains 2,600 ends and is reeded three ends per dent in a 26-dent reed. The cloth will finish about 28 inches wide.

By reference to Fig. 1, it may be seen that the pattern is a stripe composed of four sections in each repeat, as follows: First, a section of honeycomb effect, formed by weave Fig. 2,

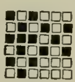


Fig. 2.

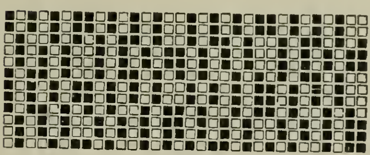


Fig. 3.

on 6x6; second, a continuous floral effect, filling flush weaves; third, a crepe effect, formed by weave Fig. 3 on 32x12; fourth, like the second section, but dropped 78 picks, one-half the number in each repeat.

There are a little more than 12 repeats in the entire width. The selvedges are each one-half inch wide, reeded the same as the ground, and show an angled twill weave effect.

The length of the pattern filling way is 2 3-16ths inches and requires 156 picks for a repeat.

As there are 200 ends in a repeat of the design, a 400-hook jacquard might be used, each pick of the pattern being read twice on each card.

THE LOOM REQUIRED

for this type of fabric is of medium weight. The pattern being small, a small jacquard head of the ordinary rise and drop type, or, if the weave is not required to be changed to form the headings of the quilt, a double action head may be used.

For the sample shown, if required to have headings at both ends to complete the quilt, differing in weave from the ground, what is termed a double or single acting automatic auxiliary cylinder jacquard would be the most economical to use.

If the ground weave was required to be repeated 25 times between headings, an ordinary jacquard attachment would require 25x156 picks in repeat, equalling 3,900 cards for the ground, whereas with the auxiliary cylinder machine 156 cards only would be required for this same section.

For larger patterns, the capacity of the jacquard would be required to correspond, i. e., with more than 400 ends in a repeat.

FINISHING.

The goods are generally woven white from unbleached yarn, and are bleached and finished after they leave the loom. A quilt will shrink in width about 10 per cent from the gray to the finished state, and increase about 1 per cent in length.

After bleaching, starching and bluing, they are cut, hemmed or fringed as desired, inspected, rolled or folded, tagged and papered.

It is not advisable to leave finished quilts unpapered for any length of time if in the same building as the bleach house, because the fumes from the bleaching liquors take out the bluing in a short time. If this is done after the quilt is folded, the bluing is taken from the outer layers only, and uneven, poor-looking quilts result.

Carding and Spinning Particulars.

The yarns of which bedspreads are composed are made in mills of the second division. There is one feature about the filling yarn which is not common to all fabrics, and that is, it is what is called soft twisted. The counts of yarn which make up the fabric to be described in this article are 24s warp and 12s filling.

THE WARP YARN

is made from 1⅛-inch staple American cotton, while the filling yarn is made from a good grade of 1-inch staple American stock. The mixing is done in the usual manner, which has been described many times before, separate bins being used for the two staples. The good sliver waste from all machines up to the slubber is mixed in at the bins. This sliver should be spread over the entire mixture and not bunched in one place; it should also be broken into short lengths so

that it will not be so apt to become tangled around the spikes of the hopper. This hopper should be kept full so as to feed an even amount of cotton to be struck off by the pin roller at the top of the lifting apron.

The raw stock for both warp and filling yarns is put through three processes of picking, the breaker picker being generally connected directly to the opener. Many different kinds of

BEATERS

are used by different mills, each claiming certain advantages over the other, but the style of beater in most general use throughout the mills is what is known as the two-bladed or armed rigid type of beater, although many mills use a three-bladed beater of the same style for the breaker picker. To sharpen the edge of this beater its side is planed. The speed of the beater used for the same stock and weight lap varies greatly in different mills and the speeds given below are the ones used in a mill making this class of goods. For the breaker picker the speed of the beater (two bladed) is 1,500 revolutions per minute, for the intermediate, 1,450 revolutions per minute, and for the finisher 1,350 revolutions per minute. The total weight of

THE LAP

at the breaker is 40 pounds or a 16-ounce lap, at the intermediate 37 pounds, or a 10-ounce lap, and at the finisher 39 pounds or a 14½-ounce lap. At the intermediate and finisher pickers the laps are doubled four into one. The draft of the finisher picker does not exceed three. At this picker it is customary to mix in the roving waste both cut and uncut. The roving waste that has not been cut from the bobbin consists of that which is made by the speeder tenders when they are putting in new sets of roving and taking off single and double. Speeder tenders should never be allowed to cut off roving; all bad work being sorted out, charged and given to them to fix. All marks should be made small and near the bobbin.

The laps from the picker are next put up

AT THE CARD,

the draft of which for this fabric should not exceed 100. The wire fillet used should be No. 33s for cylinder and 35s for doffer and top flats. The settings of the card should be the same as given for leno cotton fabrics, although some overseers use a little wider settings for this class of stock. The speed of the licker-in should be 375 revolutions per minute, cylinder 165 revolutions per minute, and the flats should make one complete revolution every 50 minutes. The card should be stripped, ground and cleaned. The weight per yard of the sliver at the front should be about 65 grains per yard, the production for a week of 60 hours being 750 pounds. This sliver is next put through three processes of

DRAWING FRAMES,

the doublings at each process being 6 into 1. For this class of goods metallic rolls may be used to great advantage. If leather top rolls are used, they should be varnished frequently and kept in good repair. See that all parts are working properly, especially those parts which coil the sliver into the cans, because if these are not working properly, the sliver cannot be run out at the next process without a great deal of breaking back of the sliver. Imperfect coiling of the sliver is a great many times caused by the cans themselves, they being out of true or having broken parts sticking out and coming in contact with part of the machine and stopping the can from turning. The only remedy for imperfect coiling is to run it over again.

The spread of the front roll of the drawing frame at each process is 375 to 400 revolutions per minute. The

WEIGHT OF THE SLIVER

for warp yarn is 70 grains and for the filling yarn, 80 grains per yard. These slivers are put up to the slubber and made into .40 hank for the 1-inch stock and .60 hank for the 1⅛-inch stock. The process of fly frames for the 1⅛-inch stock and the hank roving made at each process are as follows: First, 2 hank, and second, 6. From here it is taken to the ring spinning room and made into 24s yarn on a frame having a 2¾-inch gauge of frame, 2-inch diameter ring, a 7-inch traverse, 23.27 twist per inch and a spindle speed of 9,600 revolutions per minute. The yarn is then spooled and put through a warper and these warps put up at the slasher, the required number of ends being run on a beam at the front.

The slubber roving for the filling yarn is put on the first intermediate fly frame and made into 1 and then into 2.5 hank at the next process, after which it is taken to the mule room and spun into 12s yarn with a twist per inch of 2.75.

After leaving the loom, quilts are first boiled for 10 hours with a

CAUSTIC SODA SOLUTION

at 4 degrees Tw., rinsed well with

water and boiled again with a 4 degree Tw. caustic soda, 10 hours; rinsed well with water, soured with one-half degree Tw. oil vitriol, rinsed with water, chemicked with one-half degree Tw. chloride of lime solution, soured with 1 degree Tw. oil of vitriol and rinsed two or three times with water. The goods are placed in the kiers, each piece separate, and handled very carefully throughout the whole operation.

BEDSPREADS--Marseilles Quilts

Marseilles quilts are characterized by large embossed effects, usually of elaborate floral or geometrical design, each pattern occupying an entire quilt. The general effect is similar to what would be formed by stitching a pattern on a fine plain cloth, which effect is made more prominent in the better grades of goods by weaving a coarse plain cloth at the back and inserting wadding between the face and back cloths. When wadding is used the stitching points form deep furrows, which indicate the pattern.

One of the principal types of designs used reverses from the centre in both directions, warp way and filling way, as in Fig. 1.

When designing for this type it is necessary to make only one-quarter of the figuring design, the same occupying only one-sixth of the total number of ends in the warp, or one-half of the stitching ends. The jacquard

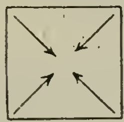


Fig 1

tie-up is on the point or centre draft principle, ∧ , which doubles the capacity of the machine as compared to a straight tie-up, and there is an attachment on the loom by which the cards are reversed when the centre of the quilt is reached filling way.

When considering the plan for the card cutter only one-half of the stitching ends and one-half the back picks in each quilt are considered, i. e., when there are two face picks to one back pick.

FIG. 2

There are two types of Marseilles weaves, known as ordinary Marseilles and fast-back Marseilles. The latter

type is used for almost all but the lowest qualities of goods.

Design Fig. 2 illustrates the principle upon which an ordinary Marseilles weave is constructed, in which the wadding lies between the face cloth

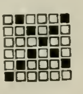


Fig. 3.

and the stitching, also termed binder, figuring, or black, ends. These ends when not required to be raised to form the pattern, remain at the back of the cloth and are not interlaced with the filling. On this account the distance, filling way, between the stitching points is necessarily limited.

In Fig. 2 the ends marked S are stitching ends, raised over the face cloth at O on the face picks and at ● on the wadding picks.

The picks marked W, shown in type /, indicate wadding, inserted for the purpose of adding weight and of forcing the face cloth up, or embossing it. When these picks are inserted, all the face ends are raised.

Fig. 3 shows the motif or order of stitching in Fig 2.

FAST-BACK WEAVES.

A fast-back differs from an ordinary Marseilles weave in having the fine filling; besides interlacing with the face ends, it also interlaces with the stitching ends when the latter are at the back between stitching points. In this way a double plain cloth is formed, either of which could be taken away and still leave a perfect single cloth.

In fast-back Marseilles quilts, both face and back weaves are plain, the pattern being formed by the stitching points.

In Fig. 4, which shows a fast-back weave completed to form the motif Fig. 3, ends S indicate stitching ends; W indicate wadding picks, and B indicate back picks.

Marks / show all face ends raised when wadding picks are inserted; stitching ends are all down on these

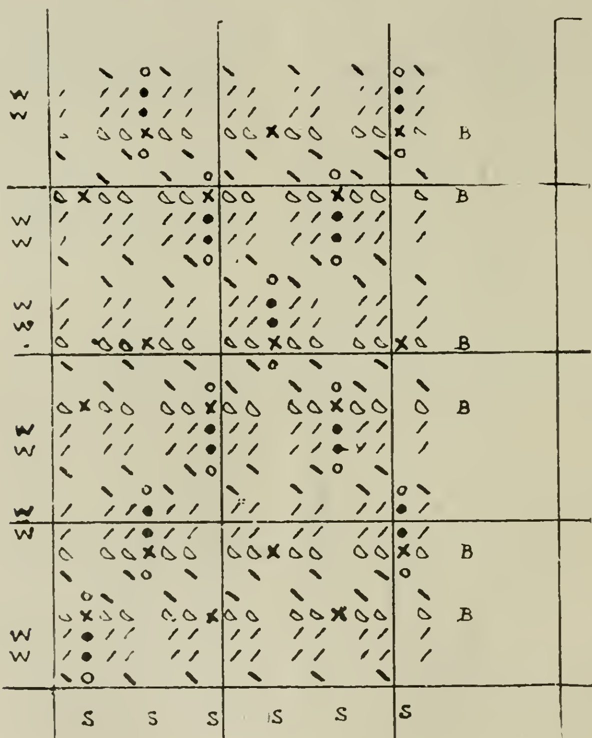


FIG 4.

same picks except where they are required to be brought through the face cloth to form a stitching point.

When the back picks are inserted, all face ends are raised, as indicated at ◊, and one-half of the stitching ends, as at x, forming a plain weave at the back.

The ends and picks not marked S, W or B form a plain weave on the face.

Marks O show where stitching ends are brought over the face cloth, each stitching point covering two face picks, to define the pattern.

A standard make of cloth made with suitable designs on the principle shown in Fig. 4 is as follows: Warp, 40s yarn for face, 20s for stitching, arranged 1 end of 40s, 1 of 20s and 1 of 40s; 80 face and 40 back ends per inch, 120 average sley.

Filling 60s yarn for face and back, 12s yarn for wadding, picked 1 pick of 60s, 2 of 12s, 4 of 60s, 2 of 12s, 1 of 60s, repeated; 200 picks per inch.

The reason why the picks are arranged as here shown in preference to arranging them 2 face, 2 wadding, 1 back, is to enable an even number of picks of one count of filling to be inserted before the shuttles are changed. This can be done on a loom having a single box at one end and a multiple box at the other.

When a pick and pick loom is used, which is in the majority of cases, 4 picks instead of 5 complete the round of filling, one pick of 6s taking the place of 2 of 12s for the wadding.

The yarns in both warp and filling are usually arranged 2 face to 1 back, making a fine effect on the face and a coarse one on the back; this in addition to the wadding picks.

Two warp beams are required, one of which, that containing the stitching yarn, is more heavily weighted than the other in order to pull down the stitching points and make the embossed effect as prominent as possible. This warp may be of equal or of different counts from the face warp. It is usually of lower counts.

LOOM REQUIRED.

The patterns being large and elaborate, a jacquard head is of necessity used, although not of such a large capacity as would at first appear.

The cards for this head control the action of the stitching ends only.

An examination of Fig. 4 will show that only 2 ends are necessary to complete the face weave, every alternate face end working similarly.

The face ends, two-thirds of the entire number, are worked most economically by harness shafts, generally placed at the rear of the comber board.

These shafts are worked from the head in a positive manner, independently of the pattern cards.

To weave a quilt like the one under consideration, say 90 inches wide, an 1,800 hook head would be required, tied up point draft.

The 20s warp would contain 3,600 ends, and the 40s warp 7,200 ends,

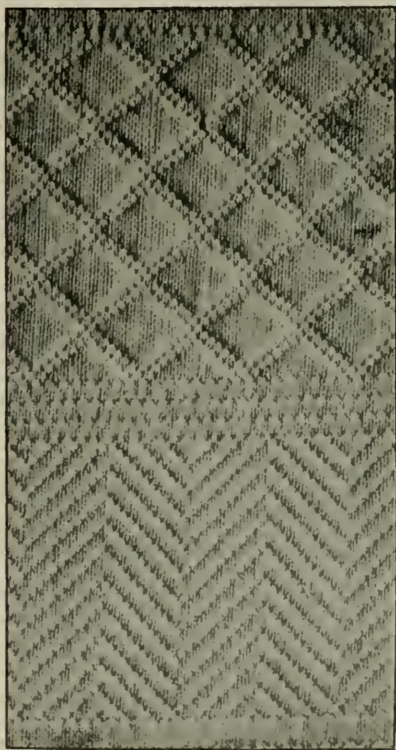


Fig. 5.

making a total of 10,800 ends in the quilt.

The Crompton-Knowles Loom Co. builds pick and pick box looms, with rise and drop jacquard heads, with figuring capacities up to 1,800 hooks, containing features or attachments specially designed for weaving these goods.

On this type of loom Fig. 4 could be woven with 8 instead of 10 picks in a repeat, the action being as follows: First pick, jacquard rises, carrying the hooks selected for stitching by pattern card; all face warp raised; wadding filling. Second pick, jacquard up; one-half of face warp up and the other

half down; fine filling; face pick. Third pick, jacquard up; face ends reverse positions; fine filling; face pick. Fourth pick, jacquard drops and then rises again, carrying with it one-half every alternate one, of the stitching ends; all face warp raised; fine filling; back pick.

The fifth, sixth and seventh picks are a repetition of the first, second and third, with perhaps the exception that a fresh selection of stitching ends have been raised.

Eighth pick, jacquard drops, then raises the half of the stitching ends not raised, and leaves down the ends that were raised on the fourth pick; face ends all raised; fine filling; back pick.

The principal advantage claimed for this machine over others is that the attachment for raising the stitching ends, one-half every fourth pick, dispenses with one-half of the number of cards ordinarily required.

Two other methods are used for actuating the stitching ends when back picks are inserted. First, by bringing jacquard cards, called plain cards, into play to work them; this method requires double the number of cards required for the same pattern on the Crompton-Knowles loom.

Second, by using 2 comber boards, drawing the odd numbered ends through one and the even numbered ends through the other, and raising each board alternately every fourth pick.

When this plan is adopted knots are put on the harness cords immediately above the comber boards so that when the boards rise the cords and ends are also raised.

Light-weight Marseilles quilts are known as Toilet quilts. They vary in weight from about 2.5 pounds to 4 pounds per quilt.

Heavy-weight quilts vary from 3.5 pounds in narrow quilts to 6 pounds for wide goods.

In the lightest and cheapest grades of fabrics wadding picks are omitted, but when made on the fast-back principle the back filling is considerably coarser than the face filling.

The processes of finishing are somewhat similar to those explained in the article dealing with crochet quilts.

Carding and Spinning Particulars.

Marseilles quilts are of a better quality than the quilts described in the preceding article, but are made in the same division of mills. The quilts under description require four different sizes of yarn, which are as follows: 40s and 20s for warp and 60s and 12s for the filling. For 12s yarn use cotton of from ⅞ to 1 inch in staple; for the 20s and 40s use 1⅛ inch stock and for 60s 1¼ to 1⅜ inch stock, all American cotton. For the filling yarn a soft twist is used and it is generally mule spun. Mix raw stock by usual method, of course the different staples being mixed in separate bins. Hand mixing is generally used on this class of goods, but it would be

OF GREAT ADVANTAGE

to use a bale breaker or willow to prepare the cotton before it is fed to openers. All stocks are put through an opener and three processes of picking. The speed of the beater (rigid two-bladed style) for all stocks except the ⅞-inch is 1,500 revolutions per minute. For the short stock the speed should be increased so as to take out the extra amount of dirt which is always in short staple cotton. The total weight of the laps at the front for all staples should be 40 pounds or a 16-ounce lap. At the intermediate the speed of the beater is 1,450 revolutions per minute for all stocks, except the short stock, where speed should be increased. The total weight of lap at the front is 37 pounds or a 12-ounce lap for the finer yarns and a 10-ounce lap for the stocks for 12s and 20s yarn. These are put up at

THE FINISHER PICKER

and doubled 4 into 1. At this picker the cut roving is mixed in in proportions that have been described in previous articles. The speed of this beater varies from 1,400 to 1,500 revolutions per minute, according to the yarn being put through, the higher speed being used for the stock for the 12s yarn. This gives the stock for 20s, 40s and 60s about 42 beats or blows per inch. The total weight of the lap at the front is as follows: 35 pounds for the 60s and 40s yarns and 39 pounds for the 12s and 20s yarns, or a 12½-ounce lap for 1⅜-inch stock, and 14-ounce lap for the other stocks. A variation of one-half pound either side of standard is allowed for all the stock, except the ⅞-inch staple, for which a variation of 10 ounces either side of staple is allowed. Follow instructions about oiling, cleaning, etc., that have been given in previous articles.

THE CARDS

should be fitted up with 34s wire fillet for cylinder and 36s for top flats and doffer. The draft of the card should be as follows: 110 for 60s and 40s yarns and not over 100 for the shorter

staples. Speed of licker-in is about 325 for long staple and 375 for ⅞-inch stock. The speed of the flats for the different stocks is as follows: 1 complete revolution in 40 minutes for 60s yarn, 50 minutes for 40s yarn, 55 minutes for 20s yarn and 60 minutes for 12s yarn. Strip cards three times a day, except for the ⅞-in. stock, when an extra stripping of both cylinder and doffer should be made, although some overseers strip only three times, while others strip the doffer only an extra time. Use same

SETTINGS

for card as were given in the last article except for the ⅞-inch stock, when those for indigo prints should be used. The production for a week of 60 hours should be as follows: 1,000 pounds for ⅞-inch stock, 800 pounds for the 20s yarn, 750 for 40s yarn and 700 pounds for 60s yarns. The weight of the sliver is 65 grains for all staples.

The cotton for 60s is combed and the instructions, weights, etc., given in the last article may be used for the 40s and 20s. The card sliver is put through three processes of picking and for the 12s only two processes are used. Either metallic or leather top rolls may be used. We should recommend metallic rolls for the coarser work.

The weight per yard at the finisher drawing should be 70 grains for all staples except the ⅞-inch, which should be 80 grains per yard. The speed of the front roll should be about 400 pounds for coarse work and 350 for finer staples.

THE DRAWING

is put up at the slubber and made into .60 hank for 20s, 40s and 60s yarns and .40 hank for 12s yarn. The roving for 60s and 40s yarns is put through three processes of fly frames and for 20s and 12s yarns two processes are used. The hank roving for each yarn and the hank roving at each process is as follows: For 60s yarn, first intermediate, 1.50; second, 4.50; and fine, 12.50 hank. For 40s yarn first intermediate, 1; second, 3; and fine, 8 hank. For 20s yarn, first intermediate, 1.50; second, 4. For 12s yarn, first intermediate 1, and second, 3 hank.

THE ROVING

for the filling yarns is generally mule spun, because a soft twist is put in, about 2.75 x square root of yarn being used. For the warp yarn a ring frame is used. Of course if this fabric is made in a mill having only ring frames both yarns will have to be ring spun. The yarns for filling after being spun at the mule are all ready to be woven after being conditioned. For spinning 40s on a ring frame use a frame with 2¾-inch gauge, 1⅝-inch diameter of ring, 6½-inch length of traverse, 28.46 twist per inch and spindle speed of 10,000 revolutions per minute; for 20s use a frame with 2¾-inch gauge, 2 inches diameter of ring, 7 inches length of traverse, 21.24 twist per inch and spindle speed of 9,400 revolutions per minute. After passing the ring frame the yarn is spooled and warped and the 40s yarn is put through the slasher.

BEDSPREADS---Satin Quilts.

Satin quilts, so called, are distinguished by having a fine, smooth ground, from which the pattern appears to stand up. This pattern is made with coarse filling interlaced with a comparatively fine warp. The latter is almost lost to view in the coarse filling, unless examined closely.

The coarse filling floats over the ground yarns to form the pattern, and under them when not required to form the pattern, being bound with binding yarns, so called, generally in plain cloth order. The binding warp is all down when the ground filling is inserted.

The ground yarns, warp and filling, are of medium counts.

Fig. 1 illustrates the effect.

The term satin is probably used on account of the fine appearance of the ground, and not from any reference to the weave, as both ground and figuring weaves are generally plain.

MINOR VARIATIONS

in weave have been made from time to time, and patents granted for them, with the result that these goods are now sold in the market under different names. In 1868 a patent was granted for this type of quilt, known then and now as Mitcheline, in which a bold figure is generally woven on a plain ground, the figure being plain, twill or satin as desired.

Other names now used for practically the same type of quilt are Duree, patent satin, embroidery and Kensington.

Although generally woven white, some

VERY GOOD EFFECTS

are obtained in satin quilts by using colored ends in stripe form for the ground, as in Fig. 2.

An analysis of the sample illustrated in Fig. 2 shows the following data: Ground warp, 30s; binding warp, 20s; ground filling, 30s; coarse filling, 3s.

All binding ends are white ends.

The ground warp yarns are arranged 3 white, 3 blue, alternately.

There are 69 ends per inch, 46 of 30s and 23 of 20s, arranged 2 of 30s and 1 of 20s alternately.

The warp yarns are usually arranged 2 ground, 1 binder, although other arrangements are used. The filling is arranged 2 of ground and 2 of coarse, or 1 pick of each alternately.

The principle of construction of satin quilt weaves is illustrated in Figs. 2, 3, and 4.

The effect seen in Fig. 2 is like the motive Fig. 3, each end of which represents 18 ends in the cloth; each pick in Fig. 3 corresponds to 8 picks in the cloth.

The complete weave is illustrated in Fig. 4, where ends B, every third end, are binding ends; picks C are coarse picks. Solid squares show where these ends and picks interlace to form a plain weave. Marks x show where the ground ends and ground picks weave plain.

Marks . (dots) show where the ground warp is raised when coarse filling is inserted, leaving the latter at the back as not being required to form the pattern.

On the same picks in which these marks occur it may be noticed that some of the ground ends, indicated by = =, are down, allowing the coarse filling to float over them. It is at these places that the latter forms the figure. In Fig. 4 these marks indicate filling. All other marks indicate warp.

Two beams are required. The ground beam is more heavily weighted than the other, the idea being to allow the coarse filling to show as prominently as possible, and this filling passing first to one side of the cloth and then the other, and lying practically flat, not being bent out of a

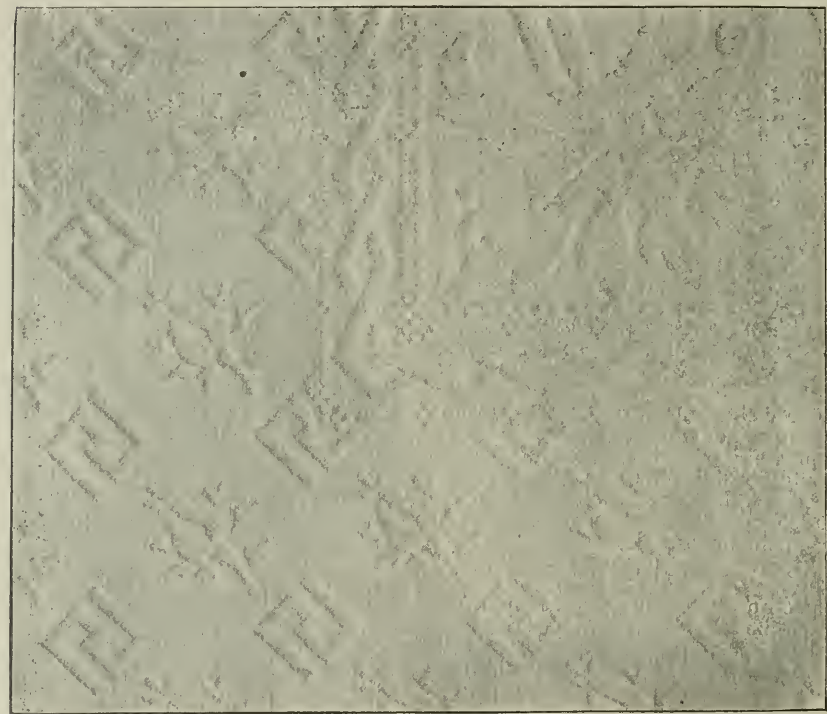


Fig. 1.

straight line by the warp, necessitates the binder warp being held somewhat slack.

The goods vary in weight from about 3 to 5 pounds.

LOOM REQUIRED.

Satin quilts, although containing fewer ends than Marseilles quilts, require a much larger number of hooks, usually from 2,400 to 3,600.

Sometimes it is necessary to use two jacquard heads over one loom. The loom part itself is somewhat similar for both types of quilts. Two

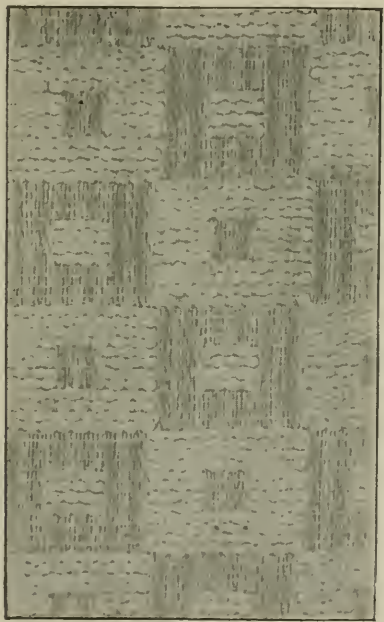


Fig. 2.

shuttles are used, one for each count of filling, picking 1 and 1 or 2 and 2 alternately as required.

The Crompton-Knowles Loom Co. build a jacquard head designed especially for weaving satin quilts. It is built straight-lift, or rise-and-drop as desired.

With this machine the ground picks are woven plain, satin, or twill as desired, without the action of the cards or cylinder. This saves labor in making the design and cutting the cards because in making a design the figure only need be dealt with. The binder ends, working plain all the time with the coarse picks, may be drawn through harness shafts and worked from the head, irrespective of the cards, as in Marseilles weaving.

The cards actually need actuate only the ground ends on the coarse picks, the remainder of the ends and picks being actuated in a positive manner by the head.

FINISHING.

The finishing of white quilts is about the same for all types, with the exception that some need more blue and starch than others. Briefly, they are bleached, washed to remove the acid, run through blue mangle, starched, dried, cut, hemmed, or fringed, inspected, folded, ticketed, bundled and packed.

In some mills it is the custom to weave the number of the loom on each quilt as it is being woven, so that if any defect shows up in any of the subsequent processes it can be readily traced to its source.

Carding and Spinning Particulars.

Satin quilts are made in the same division of mills as the fabric de-

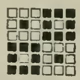


Fig. 3.

scribed in the last article. The cotton used is similar. The make-up of satin quilts differs in different mills and even in the same mill different grades of this fabric are made. The quilt that has been analyzed for this article is made up of the following counts of yarns: 30s and 20s warp yarn and 3s and 30s filling yarn. As stated above, all the yarns except the 3s would be made up of cotton of 1⅛ to 1 5-16 inch staple. The 3s would be made from a shorter staple, say ¾ to ⅞ inch, and mixed with waste, as will be shown later.

THE MIXING.

The cotton for the warp and filling, except the 3s, is mixed in the usual manner and after being allowed to stand as long as possible (in order that it may dry out), the good waste from the machines up to the slubber, which is collected at regular intervals, is mixed in at this point, care being used to break up sliver waste into small lengths and to spread the sliver throughout the entire mixing, so that it will not all be fed to the feeder at once. In some mills a very small percentage of comber waste is mixed in

at this point, but it is not the general custom to use a mixture of this kind. For the 3s yarn the mixing is made up of a certain per cent of waste, the exact percentage depending upon the mill making the quilts; it may be from 25 to 60 per cent. Generally speaking, card and comber waste is used.

PICKING.

The finer mixture is put through an opener and three processes of picking, the speeds and other particulars being the same as given in our last article for the number yarn. For the coarser yarn only two processes of picking are used, the speed of the beater at the breaker being 1,500 revolutions per minute, and at the finisher being 1,400 revolutions per minute. The total weight of the lap at the breaker is 40 pounds and at the finisher 39 pounds, or a 16-ounce lap at breaker and a 15-ounce lap at finisher. A variation of 12 ounces either side of standard weight is allowed for these laps. Look out to keep your drafts so regulated that they will not cause the laps to split and lick. These laps are next put up

AT THE CARD

and as it is the custom to use but one count of wire fillet in a mill, the count used for this style of quilts would be the same as that used for bedspreads as given in the last article.

The other particulars given in that article may also be used. Care should be taken to see that the wire fillet on the top flats does not become choked up with the fly. In cards that have been in use for some time it is the rule rather than the exception to find fly at this point. Sometimes an adjustment of the brush up may entirely remedy the defect, but if not the fly has to be picked out by hand; or a better way is to put the stripping brush on the grinding brackets and drive it at a slow rate of speed until the flats have made either two or three complete revolutions.

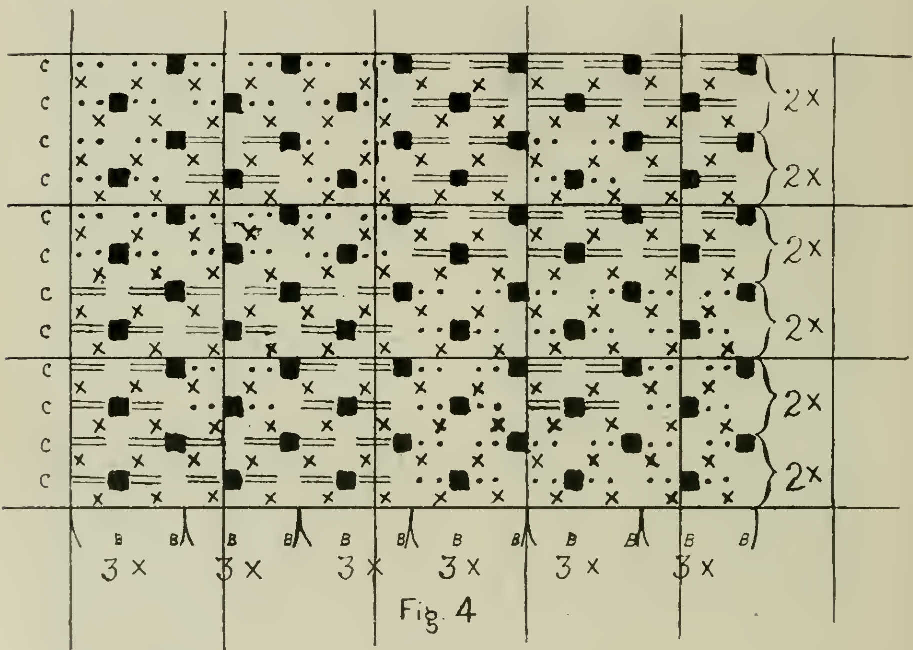


Fig. 4

ANOTHER POINT

to look out for is to see that the top flats are ground perfectly even. A great many overseers, if they look at the flats sharply, will be surprised to see that they are grinding more off of the back of the flat than at the front. This may not be the grinder's fault, but may be due to a defective grinding device, the main point being that they are not grinding in the same manner as they are working. It is just as well to grind the flats at least once a year on a flat grinding machine, the flats having to be taken

off to do this; which of course means the loss of production for that card for a certain length of time, but it will mean a better quality of sliver, which will more than offset the former, as a great deal closer settings may be used.

THE PRODUCTION

for a week of 60 hours for all counts of yarn (in this article) except the 3s should be 825 pounds and for the coarse yarn 950 pounds. The weight of the card sliver is 65 grains for all stocks. The yarn is next put through three processes of drawing for the finer counts and two processes for the coarse yarn. The top rolls used may be either leather covered or metallic. The advantages of both have been previously stated. The speed of the front rolls for the longer staple cotton is 400 revolutions per minute, and for the short staple 425, if convenient; or it may be run on the same line of machines as the longer staple cotton, when the speed of the front roll would have to be the same. The weight of the sliver for the 30s and 20s yarn should be 70 grains per yard and for the 3s, 80 or 85 grains per yard. The sliver is put through the slubber and made into .60 hank roving for fine counts and .40 hank roving for the coarser count. The roving for the 30s is put through two processes of

FLY FRAME,

the hank roving being as follows: Two hank for first intermediate and 6.25 hank for the next process; for the 20s the hank roving would be just the same at the first intermediate, but 4.50 at the last process. For the 3s the roving would be put through only one more process, where it would be made into 1 hank roving. It is the general custom to spin the yarn for this class of fabric on mules on account of the soft twist being put into it, but in some cases the yarn is spun on the ring frame. The particulars given in previous articles for 20s and 30s yarn may be used, with the exception of the twist, which should be less than that given. If mule spun, the standard for twist used should be 2.75 times the square root of the count. If the 3s are spun on a ring frame, a frame should be used with a 2¾-inch gauge, 1⅝ inch diameter ring, 6½-inch traverse. After passing through the ring frame the warp yarn is put through the spooler and warper and then through the slasher, and finally run upon a beam which has the required number of ends to make the quilt.

Dyeing Particulars.

SKY BLUE FOR STRIPES.

One per cent diamine sky blue F F; 2 per cent sal soda; 20 per cent Glauber's salt.

PINK.

One-half per cent diamine rose B D; 2 per cent sal soda; 20 per cent Glauber's salt.

LIGHT YELLOW.

One per cent chromine yellow G; 2 per cent sal soda; 20 per cent Glauber's salt.

LIGHT BROWN.

One-half per cent naphtamine brown N; ¾ per cent naphtamine yellow N N; 2 per cent sal soda; 20 per cent Glauber's salt.

RED.

Four per cent benzo fast red 4 B; 30 per cent Glauber's; 2 per cent sal soda.

LIGHT SLATE.

One per cent diamine black B H; 2 ounces diamine fast yellow B; 2 per cent sal soda; 20 per cent Glauber's salt.

LIGHT GREEN.

One per cent diamine sky blue F F; 1¼ per cent diamine fast yellow F F; 2 per cent sal soda, 20 per cent Glauber's salt; aftertreat with 2 per cent sulphate of copper.

PEARL.

One-quarter per cent diamine dark blue B; ¼ ounce diamine fast yellow B; 2 per cent sal soda; 15 per cent Glauber's salt; aftertreat with ½ per cent bichrome; ½ per cent sulphate of copper.

RAINCLOTH.

Raincloth, commonly so-called, has no particular style of construction or character of weave, the name being acquired from the fact that the fabric is waterproofed during the finishing process.

The most popular and best grades of raincloth may be defined as closely woven, smooth-face fabrics, made with twist warp, that is, cotton and wool, of cotton and worsted twisted together, and with all worsted or wool filling. The weave used for this fabric is what may be termed a five-harness satin $\frac{3}{2}$, see Fig. 1. This fabric, as the name implies, is exclusively

made up into raincoats or Cravenettes, worn principally as a covering in damp or rainy weather. The fabric, after it is finished, is impervious to water.

Raincloth is a piece dyed fabric. Such shades as drabs, fawns, light and dark browns and black are the prevailing colors. The warp yarn, as already mentioned, is a two-ply thread, composed of a very fine cotton thread and coarser count of worsted or woolen thread. The fabric is given a wool dye. The cotton does not take on color. The finished fabric presents what is termed a powdered effect, that is, little specks of white show over the entire surface of the fabric.

The fabric may be elaborated by means of mercerized cotton threads being inserted at regular intervals in

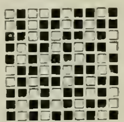


Fig. 1.

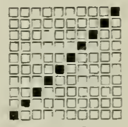


Fig. 2.

Drawing-in Draft.

both warp and filling, producing check or plaid effects, or by using a given number of solid worsted threads and a given number of twist threads arranged in some order producing a stripe effect. The fabric is also varied as regards quality, in so far that it is made with coarser counts of yarn, and less ends and picks per inch; in the cheaper qualities the plain weave and $\frac{2}{2}$ twill are much in evidence.

Analysis follows of a first-class fabric:

Width of warp in reed, 60 inches; width of fabric finished, 56 inches; ends per inch in reed, 84; ends in warp, 5,040.

21x4 reed.

Take-up of warp during weaving, 8 per cent.

Weight per yard finished, 10 ounces.

Warp yarn 2-50s worsted counts, composed 1 end of 1-30s worsted, 1 end 1-100s cotton.

Filling, 80 picks per inch in loom, 1-35s worsted yarn.

LOOM REQUIRED.

For plain raincloth, that is, a one-filling fabric, a broad Knowles dobby loom, speed from 140 to 150 picks per minute, may be used; for the five-harness satin weave the warp is usually drawn in on 10 harnesses straight draw, so as not to overcrowd the heddles and prevent chafing of the warp; for fancy raincloth the Knowles box, pick and pick loom is the one best suited for these fabrics.

FINISHING.

The better quality of raincloth requires considerable attention in the finishing process. After the fabric comes from the loom, it is dyed, the wool or worsted only taking color, the cotton in the warp yarn remaining white. Twist yarn is more or less irregular, that is, the cotton may be more prominent in some places than in others; this requires the fabric to be examined and where the cotton is found to be too prominent, it is darkened or inked in conformity with the ground color, after which follows the waterproofing process. This consists of immersing the fabric in a combination of ingredients, such as greasy matters of all natures, resin, paraffin, tannic acid, drying oils, salts of alumina, alums and carbonate of magnesia. After it is waterproofed, the fabric is pressed, made up into rolls, then made up into garments.

Carding and Spinning Particulars.

As has been stated in the analysis of raincloth given above, the material used in the construction of the yarns is wool and cotton. As in the carding and spinning particulars only the construction of the cotton yarn has been described we will follow the usual custom and give the processes, with the particulars at each stage, through which the cotton passes to produce the finished yarn. The count of the cotton yarn described for this fabric is 100s. This may be made from either a fine, long-stapled Egyptian cotton or from a Sea Island cotton of a staple of 1⅝ to 1¾ inches, the latter being the one most generally used. The bales of cotton are first stapled and graded and all those not up to standard length and quality are put one side, while the rest are mixed by hand.

A LARGE MIXING

is made so that there will be as few changes as possible in the yarn made from the different batches. It will be understood that it is often necessary to change certain parts of different machines for almost every mixing so as to suit some peculiarity of the mixing being made. These changes are generally slight and many times only

mean the changes of certain speeds or settings, but when running the different mixings the first lot run through should be carefully watched to see that it compares exactly with the foregoing mixture.

SEA ISLAND COTTON

of a long staple is put through only two processes of picking and an opener. Some overseers put the cotton through only one process. The beater used is generally of a two-bladed rigid type and if two processes are used the speed of the breaker is 1,300 revolutions per minute and the speed of the second, 1,100 revolutions per minute. As will be seen, this speed is reduced considerably from that of the other cottons that have been previously described and the reason is that a greater speed of the beater puts in neps, which, as every one knows, is the one thing to be most feared, because dirt can be taken out, but it is almost impossible to take out neps. To be sure, a greater portion of them are taken out, but it means much extra work and care to do it, so it is always best to see that none are put in. The beats per inch given to the cotton as it is passing through the finisher picker are 29. The total weight of the finished lap is 28 pounds or a 9½-ounce lap.

These laps are put up

AT THE CARD.

The settings used for this card should be close, a 12-1,000ths-inch gauge being used to set the flats from the cylinder and a 5-1,000ths-inch gauge to set the doffer from the cylinder. The wire fillet used should be No. 34s for cylinder and 36s for doffer and flats. The card should have as many working as possible and the speed should be one complete revolution every 35 minutes. The draft of the card should never be less than 130 and some overseers increase this to 175 or 180 on this class of work. The stripping should be done three times a day and grinding as usual. The card should be kept unusually free from fly and dirt and should produce from 250 to 300 pounds per week of 60 hours. The weight of the sliver should be 40 grains per yard. Another part of the machine that is changed differently from all other stock is the speed of the licker-in. This should be a great deal less than that used for other stocks for the same reason as given for the low speed of the beater. The speed of the licker-in should be dropped from 350 to 400 revolutions per minute (the usual speed) to about 275 revolutions per minute. The card sliver is next combed. The different

COMBING PROCESSES

vary, but those in most general use are as follows: sliver lap machine, ribbon lap machine and comber. The width of the lap is another part that has also been changed so that now it is 10½ inches, whereas formerly an 8¾-inch lap was almost universal. The following particulars will be given for an 8¾-inch lap; when a 10½-inch lap is used the proper weights may be calculated by proportion: The doublings at the sliver lap are 14 for an 8¾-inch lap and 20 for a 10½-inch lap.

The weight of a yard of lap at the front is 280 grains. These are put up at the ribbon lap machine and doubled 6 into 1. The weight of a yard of lap at the front of this machine is 265 grains. The laps are put up at the comber and doubled according to the number of heads that the comber contains; formerly it was the custom to have six heads, but within the last few years a comber of eight heads is used. The

PERCENTAGE OF WASTE

taken out should be not less than 20 for this class of stock and the trimmings and settings should be as follows: Combing starts at 5. Nippers open at 3½, close at 9¼. Lifters down at 6¾ and up at 8¾ to 9¼. Top combs down at 5. Feed roll commences to move forward at 5½. The start of the feed roll to a certain degree controls the percentage of waste taken out and is the part that is changed after the settings of the comber have been made. A later feeding means an increased amount of waste. The detaching roll moves forward at 5¾. There is a great deal of difference in settings, of the top combs to segment and cushion plate to needles or cylinder, among comber men, but good settings even for this grade of stock are with an 18 gauge from cushion plate to half lap and a 21 gauge from top comb to segment. Either a double or single row of needles in top comb may be used, both having their advantages and disadvantages. The weight of the sliver should be about 35 grains per yard. The sliver is next put through two processes of

DRAWING FRAMES,

the weight of the drawing at the finisher drawing being 60 grains per yard. Leather covered top rolls are generally used for this stock and should be kept in perfect shape and frequently varnished, as should the leather detaching rolls of the comber

and the top rolls of the sliver lap and ribbon lap machines. Several good recipes for varnish have been given in previous articles, one of which may be used. The sliver is put through the slubber and made into .80 hank roving. The front top rolls of this machine are generally varnished and some mills use rolls of a larger diameter, claiming less licking. The twist put in is the square root of hank being made. The slubber roving is next put through three processes of fly frames, the hank roving at each process being as follows: First intermediate, 2.25; at the second intermediate, 5, and at the jack frames, 20 hank. The standard twist per inch is the square root of hank times 1.10 at first and second intermediates and 1.20 at fine or jack frames. Care should be taken to see that the roving is properly laid on the bobbin and that the bobbin, when full, is properly built; also that the settings of the rolls and traverse are correct. This yarn is either mule or ring spun. If ring spun the particulars for a frame making 100s yarn are as follows: Gauge of frame, 2¾ inches; diameter of ring, 1⅜ inches; length of traverse, 5 inches; speed of spindles, 9,400 revolutions per minute. This yarn is then spooled and then is in shape to be twisted with the worsted yarn.

Dyeing Particulars—Piece Dyeing.

LIGHT OLIVE BROWN.

One-half per cent anthracene acid brown G; 6 ounces anthracene blue C; 2 per cent sulphuric acid; aftertreated with 1 per cent chrome.

MEDIUM BROWN.

One and one-half per cent anthracene chrome brown D; ½ per cent anthracene yellow B N; ½ per cent anthracene acid blue D; 2½ per cent sulphuric acid; aftertreat with 2 per cent chrome.

NAVY BLUE.

Four per cent anthracene acid blue D; ¾ per cent anthracene chrome violet B; 3 per cent sulphuric acid; aftertreat with ½ per cent chrome.

SLATE.

One-half per cent anthracene blue C; ¼ per cent anthracene chrome brown D; 1 per cent sulphuric acid; aftertreat with ½ per cent chrome.

OLIVE.

One and one-half per cent anthracene acid brown G; ¾ per cent anthracene brown; ½ per cent anthracene yellow B N; 1 per cent sulphuric acid; aftertreat with 1 per cent chrome.

DRAB.

Six ounces anthracene blue C; ½ per cent anthracene chrome brown D; 1 per cent sulphuric acid; aftertreat with 1 per cent chrome.

BLACK.

Six per cent anthracene chrome black F E; 4 per cent acetic acid; 2 per cent sulphuric acid; aftertreat with 2 per cent chrome.

DARK BROWN.

One per cent anthracene yellow B N; 3 per cent anthracene chrome brown D; 1½ per cent anthracene acid blue D; 3 per cent sulphuric acid; 2½ per cent chrome.

DARK GREEN

Three per cent anthracene yellow B N; 1 per cent anthracene chrome brown D; 3 per cent anthracene blue C; 3 per cent sulphuric acid; aftertreat with 3 per cent chrome.

COTTON CASSIMERE.

Cassimere was originally understood to mean a woolen cloth used for men's wear. This fabric differs from cashmere in so far as the latter is finer and used principally for ladies' dress goods. Cashmeres are usually in solid colors only, and were originally made in Cashmere and near-by regions from yarn hand-spun from the flossy wool of the Cashmere goat.

"About the year 1816, a small herd was imported into France with the view to acclimatize them and breed them for the sake of their wool, but the enterprise failed." The foregoing facts will suggest that this fabric is quite costly, consequently cheaper grades, cotton and wool imitations, have a liberal demand.

In varying the quality of a fabric, the manufacturers have two objects in view: first, to reduce the cost; second, to retain the same general appearance. It then follows that the change effected is of degree, not of kind, consequently the variations usually consist in changing the number of ends and picks per inch, or substituting a high-

er or lower grade of yarn as the case may be.

ANALYSIS.

— x x x
25 1—1—1

FACE WARP.

3 ends Black.
7 — 1 Black and drab.
— 1 Black and white.
2 — Black.
1 — Black and white.
1 — Black.
1 — Black and white.
2 — Black.
7 — 1 Black and drab.
— 1 Black and white.
1 — Black.
x2 — Black.
x1 — Bleach.
—
28

BACK WARP.

1 Green x.
2 Black.
1 Drab.
1 Black.
1 Drab.
3 Black.
1 Drab.
2 Black.
1 Drab.
1 Black.
1 Drab.
2 Black.
1 Drab.
3 Black.
1 Drab.
1 Black.
1 Drab.
4 Black.
—
28

x Alternate garnet.

FACE WARP.

11 ends Black 2/30.
8 ends Black and drab 2/30.
8 ends Black and white 20/60.
1 end Bleach 2/40.
—
28

BACK WARP.

19 ends Black 2/30.
8 ends Drab 2/30.
1 end Green 2/30.
—
28

ENDS IN FACE WARP.

726 ends Black.
528 ends Black and drab.
528 ends Black and white.
66 ends Bleach.
——
1,848
40 ends selvedge.
——
1,888

ENDS IN BACK WARP.

1,254 ends Black.
528 ends Drab.
33 ends Green.
33 ends Garnet.
——
1,848
40 ends selvedge.
——
1,888

Filling 60 picks per inch, 2/26s black cotton.

Width of warp in reed, 34 inches. Width of fabric finished, 31 inches; outside ends per inch, 111; 500x8 reed; ends in face warp, 1,848; 20 ends 2-30s white selvedge; total ends in face warp, 1,888; ends in back warp, 1,848; 20 ends 2-30s white selvedge; total ends in back warp, 1,888; total ends in face and back warp, 3,776; take-up of face warp during weaving, 10 per cent; take-up of warp during weaving, 6 per cent.

Weight of fabric per yard from loom, 7.85 ounces. Weight of fabric per yard finished, 7 ounces.

When both warp and filling are changed from wool to cotton, as with the cassimere under consideration, the general appearance may be retained, but the feel or handle of the fabric will be entirely different—so much so that it will be apparent to the buyer.

When such radical changes are made in fabrics as to substitute cotton for wool, it can no longer be sold under the same name; it therefore follows that the fabric be designated, as, for instance, cotton cassimere.

In making these cheaper grade fabrics the methods of manufacturing are

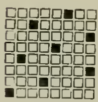


Fig. 1.

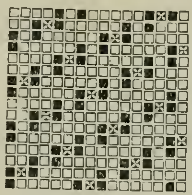


Fig. 3.

simplified as much as possible, chiefly because the profit will not admit of any unnecessary expense. No intricate weaves are used; such weaves as $\frac{2}{\;\;2}$ twill, $\frac{2}{\;\;2}$ basket weave and common rib weave are principally used for operating face warp. These fabrics are generally made with two warps. The back warp interlaces with filling on the 8-harness satin order. (See Fig. 1.) These fabrics are confined to 16 harness, 8 harness for face warp and 8 for back warp; the warp is drawn in one end face, and one end back, the first end of face warp on the first harness, the first end of back warp on second harness. (See draft, Fig. 2; Fig. 3, chain draft.)

The back warp for these fabrics is usually plain yarn, twist yarn being too expensive and the pattern of the back warp usually differs from the face warp in regard to the color arrangement, but the number of ends must be the same, if one end face warp and one end back warp fabric is required.

LOOM REQUIRED.

These fabrics may be woven on any box, harness loom. The Crompton and Knowles would probably be the most economical. The loom should

have stands for two warp beams, one for face warp and one for back warp; in some instances both warps are beamed on one beam, the back warp beamed tight because of less take-up.

FINISHING.

After the fabric comes from the loom, it is burled, examined and mended if necessary. The face of the fabric is sheared, after which it is run through a rotary press. The fabric, in passing through the press, runs over a perforated steam pipe, which partially saturates the fabric, then it is pressed by passing through heated cylinders, after which it is made up into rolls, then shipped.

Carding and Spinning Particulars.

Different mills make cotton cassimere out of different counts of yarn, but the fabric under description is composed of 2-30s warp and 2-26s filling. These yarns would be made in a mill belonging to the second division as given in a previous article. The yarn would be made from American cotton of a fair grade, having a staple of about 1⅛ inches. The mixing should be done by one of the various methods that have been given in previous articles. The only point to be looked out for is to see that the cotton is thoroughly dry and aired out before being put through the opener. For this class of fabric the raw stock is put through three processes of picking and an opener. The good waste from all machines up to the slubber is mixed in before the cotton is fed to the opener. This waste should be picked up at regular and frequent intervals and spread throughout the entire mixing, and snould not be allowed to accumulate in large lots, but should be run up as fast as collected. The

LIFTING APRON

should always be carrying up a load of cotton for the pin beater to strike off. This beater should be so adjusted that the proper amount of cotton is passed to the breaker picker, which is generally either directly connected or is connected by trunking or lattice work to the opener. The beater of the breaker picker for this kind of stock is generally of a two-bladed rigid type and its speed is 1,550 revolutions per minute. The total weight of the lap at the front is 40 pounds or a 16-ounce lap. These laps are put up at the intermediate picker and doubled four into one. The beater of this machine is also generally of a two-bladed rigid type, the speed of which is 1,500 revolutions per minute. The total weight of the lap at the front of this picker is 37 pounds or a 10-ounce lap. These laps are put up at

Fig. 2.

THE FINISHER PICKER

and doubled four into one. It is at this point that the cut roving waste is mixed in with the raw stock. This is done by two methods, both of which have been described in a previous article. If done by hand, care should be taken to see that the percentage of cut waste mixed is not too great, because this is apt to cause licking of the laps when they are being run at the card. The beater of this machine may be either a two-bladed rigid or a pin beater, either of which has its advantages. If of the two-bladed rigid type, the speed should be 1,450 revolutions per minute. This gives the cotton passing under its action 42 beats per inch. Care should be taken to see that all the drafts in the pickers are properly directed where they will do the most good. The total weight of a lap for this class of goods should be 39 pounds or a 14½-ounce lap. A variation of the standard of half a pound (either side) is allowed. All laps varying more than this are run through the finisher picker again. The picker laps are put up

AT THE CARD,

the draft of which for this class of

work should not exceed 100. The wire fillet used should be No. 33 for cylinder and 35s for doffer and flats. This is the American count of the wire; the equal English count is No. 100s for cylinder and No. 120s for doffer and top flats. The settings of the card should be the same as given in connection with the article on "Indigo Prints." Strip cylinder and doffer three times a day and grind lightly at least once a month—twice a month is better—and then leave the grinder on half a day. The teeth should always be kept sharp and never allowed to run faced. It is the general rule of grinders to set cards after grinding in large rooms where several grinders are employed. It is better to have one grinder or boss grinder to set all the cards and hold him responsible. Keep cards clean, especially the front end around and over the doffer bonnet. The speed of the licker-in should be 375 revolutions per minute. The flats make one complete revolution every 45 minutes. The sliver at the front weighs 65 grains per yard and the production is 800 pounds per week of 60 hours.

THE SLIVER

at the cards should be sized at least once a week to see how it is comparing with previous sizings. The sliver is next put through three processes of drawing frames, which may have either metallic or leather-covered top rolls. If metallic rolls are used, keep them clean, because if dirt and waste collect in the flutes of either the top or bottom rolls, cut roving is almost sure to result. Keep top and bottom rolls well oiled. If top rolls are not kept oiled and are allowed to become dry, bad work is sure to result. Also see that the calender rolls have enough pressure on them to cause them to condense the sliver properly. Look out to see that the trumpets have the right size hole at the small end. The drawing frame sliver should be sized at least three times a day, and if sized four times it keeps the work a great deal evener. The sliver from at least four heads of each frame is taken and sized separately and then averaged; a variation of not more than 5 grains either side of standard is allowed; if more than this, the draft gear is changed.

THE DOUBLINGS

at the drawing for this kind of work are 6 into 1 at each process. The speed of the front roller is 400 revolutions per minute. The weight of the sliver is 70 grains per yard. The drawing is next put through the slubber and made into .60 hank roving. It is not customary to varnish the slubber top leather rolls for this kind of work. See that the traverse is working properly and that the top rolls are in perfect condition and set properly. Keep slubber as clear as possible and it will make returns many times over in extra production, which is often affected by dirt, fly, etc., getting between the gears and filling up the teeth.

THE SLUBBER ROVING

is put through two more processes of fly frames, the hank roving being made at each as follows: First intermediate, 2.00, and second intermediate, 6.00 hank for the warp yarn and 5.25 hank for the filling yarn. Try to keep the roving a little on the heavy side of the standard and don't put more twist into roving than is actually needed to draw it so that it won't break back at the next process. Remember that every extra tooth of twist put in cuts into the production to that extent. Keep the top rolls in good condition and change them frequently. Keep the chains clean and look out for bunches. Look out for single and double and watch the tension and the taper of the bobbin. Do not let the help fill up the bobbin after the frame has knocked off, but first be sure that the frame will knock off at the proper place. Keep frames well oiled and don't run bare spindles.

ANOTHER THING

to watch is jumping bobbins; set the gear properly to remedy this. Replace all broken bolsters as soon as possible. After changing a frame over, use up all pieces from it as soon as possible. The roving for the warp yarn is spun on a ring frame having the following particulars for 30s yarn: Gauge of frame, 2¾ inches; diameter of ring, 1¾; twist per inch, 26.02, and speed of spindle, 9,800 revolutions per minute. The yarn is then spooled, twisted into 2-ply yarn, spooled, and then warped, after which it is put through the slasher and run on to a beam with the required number of ends. The roving for filling may be either mule or ring spun; if the latter, use a frame with a 2¾-inch gauge, 1⅝-inch diameter ring and spindle speed of 8,000. This yarn is then twisted into 2-ply 26s, after which it is conditioned and then is ready to be used.

Dyeing Particulars.

BLACK.

Ten per cent thion black T B C; 20 per cent sulphide sodium; 2 per cent soda ash; 30 per cent salt.

BROWN.

Ten per cent thion brown R; 2 per cent thion violet black A; 1 per cent thion yellow G; 10 per cent sodium sulphide; 2 per cent soda ash; 25 per cent salt.

DARK GREEN.

Eight per cent thion green B; 8 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

PEARL.

Four ounces thion violet black A; 1 per cent thion black T B C: 1 per cent sodium sulphide; ½ per cent soda ash; 10 per cent salt.

DRAB.

Three per cent thion green G; 3 per cent thion orange N; 6 per cent sodium sulphide; 2 per cent soda ash; 20 per cent salt.

NAVY BLUE.

Six per cent thion navy blue R; 2 per cent thion blue B; 8 per cent sodium sulphide; 3 per cent soda ash; 30 per cent salt.

SLATE.

One and one-quarter per cent thion black T B C; 1½ per cent sodium sulphide; 2 per cent soda ash; 10 per cent salt.

RED.

Twenty per cent thiogene rubine O; 10 per cent sulphide sodium.

BLUE BLACK.

Ten per cent thion blue black B; 10 per cent sulphide sodium; 3 per cent soda ash; 30 per cent salt.

ONDULE FABRICS.

Ondule fabrics are characterized by having one or both series of yarns, warp or filling, drawn out of a straight line, while yet remaining in the same relative positions, i. e., the curving of the yarns is not made by certain yarns crossing over others as in leno and similar fabrics.

They may be placed in the novelty class. As such, the production is limited in quantity in cotton goods by several factors, among which may be mentioned: First, costly loom attachments have to be applied in order to weave them to the best advantage; second, the demand is small and uncertain.

Fig. 1 illustrates the effect formed in warp ondules, in which the filling remains in straight lines, as in any or-

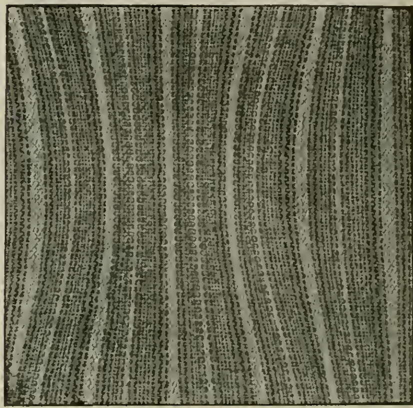


Fig. 1.

dinary fabric. The warp forms the undulations.

This type has not been developed to any extent in cotton goods on account of the reasons mentioned, and for another reason. Some of the ends curve considerably more than others, necessitating the use of several warp beams in order to have the ends at such a tension that some will not be

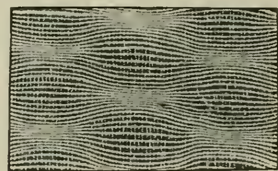


Fig. 2.

slack in the shed, while others are tight. The sample in question, although containing only two different counts of warp yarns, one fine and one coarse, required five warps.

It will be understood readily that a greater length of warp will be required for a curved end than for a straight end in a given length of cloth.

The white warp yarn in Fig. 1 is cotton.

When woven in only one color or one count of warp the stripe effect is very faint.

The ondule principle of construction is not of recent origin, similar

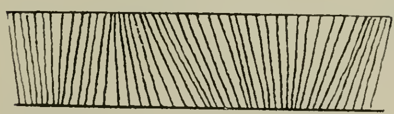
goods having been made to some extent in the early part of the 19th century.

Filling ondules are of more recent origin than warp ondules, and may be made much cheaper, one warp only being required. Fig. 2 illustrates the effect of a good filling ondule, in which the filling yarns form curved or wavy effects, the warp yarns remaining parallel to each other. The filling is considerably coarser than the warp, which accentuates the desired effect.

Fabrics like Figs. 1 and 2, or of combinations of these two effects, may be made with similar loom attachments or devices. The attachment generally used consists of a suitable mechanism, varying in detail with different makers, for imparting to the reed, which is very deep, an up and down movement, so as to bring a different part of it to the fell of the cloth at each pick.

The reeds used are of special construction. In those used for warp ondules the dents are arranged somewhat like Fig. 3.

Fig 3

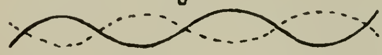


The top, bottom and face of the reeds are straight, as in ordinary reeds.

For weaving filling ondules the same device may be used for actuating the reed. The reed itself is made after the form shown in Fig. 4. The solid line indicates the top, and the dotted line the bottom of the reed. The dents are equal distances apart, both at the top and bottom. When this type of reed is used, a false reed is also used as a guide for the shuttle, as in lappet weaving. Another type of reed used is made fast at one end, and in loose sections at the other. These sections contain, say, three or four dents. An engraved or grooved roller is made to separate and change the positions of the sectional end of the reed as desired.

Fig. 5 illustrates a cotton fabric intended to imitate the high-class filling ondules. To obtain this effect two leno easers or slackeners have been used instead of the reed motion. There are 30 ends in each pattern, 15 of which were placed over the first and 15 over the second easer. The easers were then actuated so that the yarn over one of them wove slack for eight picks while the yarn over the other was held tight, then vice versa for eight picks. The selvedge ends were placed over the regular whip roll. Two warp beams were used, although one would perhaps have answered better. This is a simple meth-

Fig 4.



of obtaining the waves, but the effect obtained is not as good as when a special reed is used; nor can it be depended on, not being a positive motion. The easers have to be adjusted to a nicety and kept in that condition or each alternate section will appear more prominent than the others.

Fabrics showing a much better effect than that shown in Fig. 5 may be produced by the yarn easing method.

The construction data for the sample is as follows:

Ends per inch, 48; picks per inch, 48; width, 27 inches; warp yarn, 50's cotton, combed American; filling yarn, 2-40s cotton, Sea Island, mercerized; 696 ends on number 1 beam—this includes 48 for selvedges; 648 ends on number 2 beam, total, 1,344 ends; weight, 8 yards per pound; reed, 1 end in each dent; the weave is plain on 4 harnesses. The attachments can be

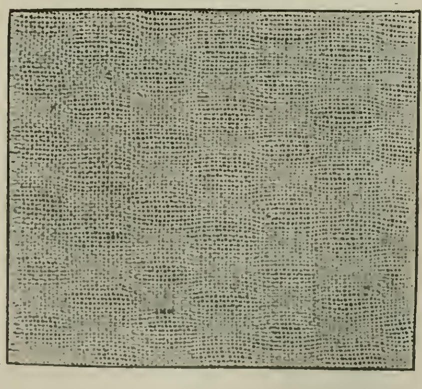


Fig. 5.

applied to and these goods made on any ordinary dobby loom.

Carding and Spinning Particulars.

There are a great many different styles of ondules and these com-

prise many different counts of yarn according to the grade and quality of the fabric being made. This class of fabric is made in mills of the third division, as given in a previous article, or at least those plants whose equipment of machinery includes combers. The fabric that has been selected out of this class of goods is made up as follows: For the warp, 50s yarn is used and is made of an American cotton, generally the kind called peeler, having a staple of 1¼ to 1 5-16 inches, being used, and for this fabric is combed. For the filling yarn a Sea Island cotton of 1½ inches is used. This is also a combed yarn, the count of which is 2-40s. For this article we will take each yarn and treat it separately, starting with the mixing.

MIXING.

First take the American yarn. This is mixed,as has been previously stated, at the mixing bin; the sliver waste from the machine up to the slubber is used. Care should be taken to see that too great an amount of this is not being made at the different machines. It is impossible to avoid making this waste altogether, but a large percentage of it may be saved if watched carefully. This cotton is put through an opener and three processes of picking. Keep the hoppers of the openers well filled so as to obtain as even a feed as possible at the breaker picker. The speed of the beater at this machine is 1,050 revolutions per minute. See that the pin beater is set properly to obtain the required weight per yard of cotton being fed to the breaker picker. This picker is generally provided with a two-bladed rigid type of beater, the speed of which is 1,550 revolutions per minute for this class of work. The total weight of lap at the front is 40 pounds or a 16-ounce lap. These laps are put up at the intermediate picker and doubled 4 into 1. The beater of this picker is like that of the breaker, and its speed is 1,450 revolutions per minute. The total weight of the laps at the front of this picker is 37 pounds or a 12-ounce lap. The laps are put up at the finisher picker and doubled 4 into 1. The speed of the beater, if a rigid, two-bladed type, is 1,450 revolutions per minute, which gives the cotton passing through it about 42 beats or blows per inch. The total weight of the lap at the front is 37 pounds or a 12½-ounce lap. A variation of one-half a pound is allowed either side of standard; laps over or under this weight are run through the finisher again. At the finisher picker the cut waste from the fly frames is mixed in in the proportion of one lap of cut waste to three laps of raw stock. Be careful not to use too much cut waste, as it is apt to cause the laps to kick; also be careful to see that the drafts of the pickers are properly directed for the same reason. At the card the draft is not less than 100, a good draft being 120. The speed of the cylinder is 160 revolutions per minute; licker-in, 300 revolutions per minute; and the top flats make one complete revolution every 34 minutes.

DOFFER AND CYLINDER.

The doffer should be as large as possible and clothed with a No. 35s wire fillet, as should the top flats; the cylinder is clothed with No. 34 wire fillet, the equivalent English count being 120s for doffer and 110s for cylinder. Keep this wire sharp at all times, as dull wire is apt to cause kinked yarn. Grind at least once a month and reset all points after grinding. It is a good plan, although one not generally used, to brush out cylinder and doffer after grinding and before setting up. See that the grinding brackets for the top flats are set so as to grind the flats evenly across their face, when in their working position. This is

A GREAT FAULT

with most of the grinding devices and should be carefully looked into. See that the doffer stripping comb is set to clean the doffer of the web properly. Strip cards three times a day and keep front free from dirt and fly. The total production for a week of 60 hours, allowing 10 per cent time for stoppages, etc., is 550 pounds and the sliver weighs 45 grains per yard. The sliver is then combed.

BEFORE BEING COMBED

it has to be run through several different processes. The order of these, as well as the machines themselves, differs, but it is most general to have the machines as follows, especially for this class of work: Sliver lap machine, at which the doublings for an 8¾-inch lap are 14 into 1, the draft of this machine being small, less than 2; the weight per yard is 285 grains; for larger width laps the doublings and weight per yard may be found by proportion; this is also true at the ribbon lap machine. At the ribbon lap machine the doubling is 6 into 1, and the weight of the lap is 265 grains per yard. These laps are put up

AT THE COMBER

and doubled according to the number of heads, 6 or 8 being generally used, a

6-head comber generally using an 8¾-inch lap and an 8-head comber a 10½-inch lap. These particulars are given for the Heilmann combers and not the later foreign makes, which have been tried with varying success the last four or five years. For this stock take out 15 per cent waste and set time as given in a previous article. The speed should be about 95 nips per minute. Keep all the leather top rolls of sliver and ribbon lap machines as well as those of the draw box and detaching rolls of the comber in perfect condition and well varnished. It is a good plan to varnish the leather-covered detaching rolls once a week. A little trouble in this direction is well repaid. Look out to keep the percentages of

WASTE

at the different machines uniform.

If two or more ends break down on the table, break end running into the can, and before piecing up again, see that all the ends are running. Combers should be scoured at least once a year, when they should be taken down and all parts reset and timed. Keep table smooth and polished and do not touch with the hands those parts over which the combed sliver is running. The weigh per yard of the combed sliver is 40 grains. This sliver is put through two processes of drawing, being doubled 6 into 1 at each process. Leather-covered top rolls are generally used for this class of stock and they should be looked out for to see that they are well oiled and varnished and in perfect condition. See that all stop-motions are in working order so that single and double may be prevented as far as possible. The weight of the drawing is 70 grains per yard. This is put through the slubber and made into .50 hank roving, after which it is run through three processes of

FLY FRAMES,

the hank roving at each being as follows: First, 1; second, 3, and jack, 10 hank. Watch the leather rolls, also the shape and lay of the roving on the bobbins. Mark all roving small and distinctly near bobbins, and do not allow pieces to accumulate. This roving is taken to the ring spinning room and made into 50s on a frame having a gauge of 2¾ inches, diameter of ring, 1½ inches, length of traverse, 6 inches, and spindle speed of 10,000 revolutions per minute. The yarn is then spooled and warped, after which it is put through the slasher, where in addition to being slashed the required number of ends are run on to one beam, and then it is ready for the weave room.

The Sea Island cotton for

THE FILLING YARN

is put through either one or two processes of picking, generally two. The speed of a two-bladed rigid type of beater at the breaker is 1,350 revolutions per minute, and the total weight of lap is 30 pounds or a 10-ounce lap. These laps are doubled 4 into 1 at the finisher picker. The speed of the two-bladed rigid type is 1,250 revolutions per minute, or about 29 blows or beats per inch of cotton passing through. The total weight of this lap is 28 pounds or a 9½-ounce lap. At the card the draft should not be less than 120, the speed of the licker-in, 275 revolutions per minute. The top flats make one complete revolution every 35 minutes. The production is 300 pounds per week of 60 hours, and the weight of the sliver 40 grains per yard.

THE SETTINGS

for the card should be somewhat closer than when carding peeler cotton; for example, the doffer should be set to the cylinder with a 5 gauge instead of a 7 gauge, and the flats should be set with a 10 gauge instead of a 12 gauge, which is used to set peeler cotton. The other particulars given above may be also used with Sea Island cotton. This sliver is next put through the same machines as given above for combing. The weight of the sliver lap machine is 240 grains per yard and the ribbon lap 220 grains per yard. The settings at the comber should be closer than those used on peeler cotton and the percentage of waste taken out should be 20 per cent. The weight of the sliver is 35 grains per yard.

This sliver is put through two processes of

DRAWING,

being doubled 6 into 1. The speed of the front roll should be 350 revolutions per minute, and the weight of the sliver 60 grains per yard. It is important that extra care be taken with the top rolls, stop-motions, etc., when running this kind of stock, otherwise the particulars given with peeler cotton may be followed. The leather top rolls of the slubber are varnished for this stock and it is better to use rolls of a little larger diameter than those used for peeler cotton. The hank roving made at the slubber is .65, which is put through two processes of fly frames, the hank roving being made at each process being as follows: First intermediate, 2.25; and

second, 8 hank. Use a finer grain leather for the roll covering than that used for peeler cotton and look out for all the particulars given above, except that extra care should be given to the Sea Island stock. This roving is taken to the mule room and spun into 40s yarn, after which it is generally mercerized under tension and twisted into two-ply 40s, when it is ready to be woven.

Dyeing Particulars.

LIGHT SKY BLUE.

Two ounces diamine sky blue F F; 20 per cent Glauber's; aftertreat with ½ per cent sulphate copper.

LIGHT PEA GREEN.

One-quarter per cent diamine sky blue F F; ½ per cent diamine fast yellow F F; 20 per cent Glauber's salt; 1 per cent sal soda; aftertreat with 1 per cent sulphate copper.

PEARL.

Two ounces diamine brilliant blue G; 15 per cent Glauber's salt; aftertreat with ½ per cent sulphate of copper.

PINK.

One-half per cent erika pink; 10 per cent Glauber's; 1 per cent sal soda.

CREAM.

One-thirty-second ounce diamine fast yellow B; 1-64th ounce diamine catechine 3 G; 10 per cent Glauber's; 1 per cent sal soda.

LIGHT BROWN.

One-half per cent diamine brown M; 1 per cent diamine catechine 3 G; 20 per cent Glauber's; 1 per cent sal soda; aftertreat with 1 per cent chrome.

GREEN.

Two per cent diamine green G; 20 per cent Glauber's; 2 per cent sal soda.

LIGHT SLATE.

Two ounces diamine dark blue B; 1-16th ounce diamine fast yellow B; 10 per cent Glauber's; 1 per cent sal soda; aftertreat with ½ per cent chrome and ½ per cent sulphate of copper.

LIGHT SNUFF BROWN.

Six ounces diamine catechine 3 G; 6 ounces diamine catechine B; aftertreat with ½ per cent chrome and ½ per cent sulphate of copper.

SLATE.

One per cent diamine black B H; 2 ounces diamine fast yellow B; 20 per cent Glauber's; 1 per cent sal soda; aftertreat with ½ per cent chrome; ½ per cent sulphate of copper.

UMBRELLA CLOTHS.

The name given to these fabrics indicates the use to which they are subjected. It stands for cloths of widely different qualities, materials and weaves. The weaves, with the exception of those used for umbrella ginghams,are of small repeating types, as plain, three-end twill, and five and six end twills of four interlacings in a repeat.

Being subjected to extremes of weather,the constructions of the cloths are necessarily good.

All-cotton umbrella cloths are usually woven white, then piece dyed in solid colors. For cotton warp and worsted filling goods the warp yarn is usually dyed before being woven. This is especially the case in colors other than black. It is much harder to get a fast color, one of the essential features of a good umbrella cloth, on union piece dyed goods than on yarn-dyed goods. Black is the principal color used.

IN THE BETTER GRADES

of umbrella cloths it is common to find silk or wool in combination with cotton. These materials are sometimes combined in the same yarn, being mixed before being spun. In other cases the yarns on a beam are all of one material, and yarns of different materials, from separate beams, are used in one fabric.

The analysis of a good grade of umbrella cloth shows it to have been made of silk and cotton, the selvedges being of silk and the body of the warp arranged two ends of cotton and one end of silk alternately. The filling is cotton. This is a so-called silk umbrella cloth.

A good cotton umbrella fabric with a twill weave is constructed as follows: Ends per inch, 84; picks per inch, 112; width in reed, 28¾ inches; width of cloth, 27 inches; ends in warp, 2,312; reed, 2 ends per dent; warp, 60s combed American cotton; filling, 40s combed Egyptian cotton; weave $\frac{1\ \ 1}{2\ \ 1}$ twill. Plain selvedges. The cloth was woven on 12 harnesses, 2 for selvedges and 10 for ground.

One of the most essential features of a good umbrella cloth is a good selvedge, as upon such depends not only the appearance of the cloth, but its utility. A cloth between two ribs of an umbrella would be worthless if it contained a broken selvedge.

We will consider a plain weave um-

brella cloth, containing a good selvedge, where 2 picks work as one and 2 picks are inserted in each shed. The ground is reeded 2 ends in each dent and the selvedges 4 ends per dent.

The construction of this fabric is 96 ends per inch of 60s warp yarn: 104 picks per inch of 56s filling; American warp and Egyptian filling, combed stock.

An ordinary single box dobby loom is generally used when making these goods, the large number of ends per inch necessitating a greater number of harnesses than are usually run on cam looms.

Care has to be exercised,when weaving, to make the goods as near perfect as possible, because defects made in the loom have to be remedied afterwards, or the goods have to be sold as seconds.

FINISHING.

On account of the combinations of materials found in mixed umbrella fabrics the finishing and dyeing processes are of great importance and have to be done with care in order that each material will look the same when finished, and retain its color under severe usage. Especial care has to be taken with silk selvedge goods because, if the selvedges are damaged, the goods have to be sold for other purposes, with a consequent loss in price.

Cotton umbrella cloths are singed or sheared, crabbed and steamed. If they contain silk selvedges, the latter are moistened slightly just before they reach the singe plates or flames.

When the goods are required to be sheared, they are first thoroughly burled, all knots and other uneven imperfections being removed so that the cloth will present an even surface,free from holes, after shearing. When steaming and drying the goods, it is necessary to have them started and kept straight, that the warp yarns may be straight and the width uniform throughout the piece.

Carding and Spinning Particulars.

The goods considered in this article are made in the same kind of mill and from the same grade of yarns as ondule fabrics, which were dealt with in the previous article. The carding and spinning data of the one will therefore apply equally well to the other, and need not be repeated here.

Dyeing Particulars.

FAST BLACK.

Dyed on the jig machine. First bath, 100 gallons; 8 pounds immedial black N N; 10 pounds sodium sulphide; 3 pounds soda ash; 25 pounds common salt; run the pieces through for one hour, take off to a washing machine, and give a good rinsing with water; aftertreat with 3 per cent chrome; 3 per cent acetic acid for 30 minutes at 180 degrees F.; soap with 10 pounds soap; 2 pounds olive oil; 4 pounds sal soda; 50 gallons water at 180 degrees F., and rinse. Boil the soap, olive oil and sal soda together for one hour before using. For subsequent lots 2 per cent soda ash, 7 per cent immedial black N N, 8 per cent sodium sulphide, 6 per cent common salt will be sufficient for the dyeing process.

A SULPHUR BLACK

is the fastest to light, washing and general wear. Another black can be dyed with sulphur black topped with logwood: Six per cent immedial black N G; 10 per cent sulphide soda; 2 per cent soda ash; 20 per cent salt; rinse well, and aftertreat with 2 per cent chrome; rinse and dye with 5 per cent extract logwood; rinse and soap at 150 degrees F.; ½ ounce soap to 1 gallon water.

And again a good black can be dyed with a one-dip black fixed with chrome which is very fast to light and washing, but not so fast as sulphur black.

A ONE-DIP BLACK.

Ten per cent diamine fast black F; 2 per cent sal soda; 30 per cent Glauber's salt; dye at the boil for one hour; rinse and aftertreat with 2 per cent chrome; 2 per cent sulphate copper at 175 degrees F.; 3 per cent acetic acid; rinse well and soap with weak soap solution at 150 degrees F.

HUCKABACK TOWELS.

Huckaback, or huck, is a name given to a certain type of weave which is extensively utilized in the manufacture of towels, being excellently adapted for that purpose.

Two of the principal features desired in a towel are, first, strength; second, a readiness to absorb moisture.

An examination of huckaback, Figs. 1 and 2, will show that it is composed for the greater part of plain weave; this gives strength to the fabric.

The moisture-absorbing qualities of a huck towel are aided by the long floats of yarn which appear regularly,

as on ends and picks 2, 4, 7 and 9 of Fig 2, as well as in the light twist or small number of turns per inch put in the yarns. The softer twisted the yarns, the better they are adapted for toweling.

The selvedge ends, which are required to bear the greatest amount of friction of any of the yarns in the loom, are usually of 2-ply yarns, whereas the yarns in the body of the cloth are single, twisted not any harder than is necessary to enable them to weave well.

Huckaback toweling is sold to the consumers in various ways, by piece,

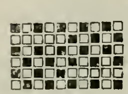


Fig. 1.

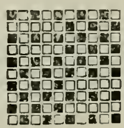


Fig. 2.

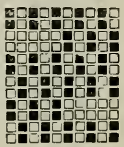


Fig. 3.

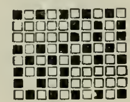


Fig. 4.

yard and towel. The cloth sold by the piece or yard is generally white. Completed towels, which are usually hemmed, hemstitched, or fringed, vary in size from about 17 by 32, to 25 by 45 inches for general use. A favorite size for barbers' use is 14 by 26 inches. These are all white, or are white in the body of the towel and colored on the borders, usually with light red or blue.

Towel borders usually consist of alternate stripes of colored and white filling, varying relatively in size as desired, and of weaves other than those of the huckaback type.

An analysis of a huckaback towel shows the following construction data: Ends per inch, 50; picks per inch, 44; width of cloth, 17½ inches; warp yarn, 14s; filling yarn, 10s; ends in warp, 854 of 14s for the body of the cloth, 40, i. e., 20 on each side, of 2-28s for selvedges; 23 reed, 2 ends of 14s per dent; selvedges, each 20 ends, drawn as 10 in 5 dents; the weave is shown in Fig. 3. The drawing-in draft for reproduction on a dobby loom is straight, with Fig. 1 as a chain draft. Weave Fig. 3 differs from the chain draft Fig. 1 in having two picks in a shed.

To enable a greater length of cloth to be woven in a short time, in fact, in one-half the running time ordinarily required, two strands of filling are wound together as one on a bobbin and run off together in the loom. In reality, although the cloth contains 44 picks per inch, the shuttle traverses the loom lay only 22 times to weave one inch of cloth.

Another method of inserting two picks in a shed at once is by the use of a shuttle containing two bobbins of filling. Objections to this method are that it is necessary to use a shuttle of a greater length than can be run on an ordinary loom, and extra waste is made if the filling from both bobbins does not end at the same time.

Huckaback towels are usually made of linen, cotton, or a combination of linen and cotton. A cloth under consideration of the latter type, of a good quality, is 18 inches wide and contains 58 ends and 37 picks per inch finished. The yarns in both warp and filling, with the exception of the selvedge ends, are single. There are 8 ends of 2-ply yarn for each selvedge.

Fig. 4 is the weave used for this cloth; 12 harnesses are required, 10 for ground and 2 for selvedges.

LOOM REQUIRED.

For plain white huckaback toweling an ordinary dobby loom is used, one warp beam and one shuttle only being required. Coarse cloth is usually woven on 4 harnesses, with a cross draw.

When colored borders are required a dobby box loom containing a repeater or multiplier motion is the best to use. A fringe motion is added to this when both borders and fringe are required. This motion automatically pulls the cloth forward several inches between each two towels, the distance being regulated as desired.

Carding and Spinning Particulars.

Huckaback towels are made up of various counts of yarns which differ according to the mills in which they are made, and also several grades may be made in a single mill, but the division of mills that they are made in is the second. The fabric under description is made up of 14s warp yarn and 10s filling; the selvedge yarns are 2-28s.

THESE YARNS

are all made up of American cotton, the warp and filling yarns being made from a 1¼-inch staple and the selvedge yarn of 1 5-16-staple cotton. The cotton for these mixings is mixed by hand, large mixings being made. They are put through an opener and three processes of picking. Only those openers that have the best means of cleaning the pin beater

should be used, as there are several on the market which do not clean the pins properly. Especially is this the case when running sliver waste, the waste becoming wound around the beater, which will be seen to be a great detriment.

THE BEATERS

of all three of the pickers are generally of the two-bladed rigid type and the particulars given below will be applied to them. The speed of the breaker picker beater for this stock is 1,550 revolutions per minute and the total weight of the lap at the front is 40 pounds or a 16-ounce lap. These laps are doubled four into one at the intermediate picker and pass to the beater, the speed of which is 1,450 revolutions per minute. The total weight of the lap at the front of this machine is 37½ pounds or a 10-ounce lap. From the intermediate picker the laps are put up at the finisher picker and doubled four into one. The speed of this beater is 1,400 revolutions per minute. The total weight of the laps at the front of this picker is 39 pounds or a 14½-ounce lap. The laps are allowed a variation of one-half a pound either side of the standard weight. When more than this, they are put up at the back and run through the picker again.

WATCH THE EVENER

motion to see that it is working properly. The cotton at the finisher picker receives 42 blows or beats per inch fed. This cotton is generally a very dirty cotton and care should be taken to get all the dirt out possible, so that the cards will not have to do picker work. The laps from the picker are put up at the card, the draft of which is generally not more than 95. The speed of the licker-in is generally 300 revolutions per minute and the top flats make one complete revolution every 50 minutes. The settings of the card should be the same as those given in the article on "Indigo Prints."

THE STRIPPING

should be done three times a day and cards, especially the fronts, should be kept clean. The cards should be ground at least once a month, when the grinding rolls should be allowed to stay on half a day. Always grind lightly and it is a good plan to have traverse grinding rolls send the grinding disk across the surface of the wire fillet as quickly as possible and not in the slow manner in which it is generally done. Look out for the emery on the grinding disk to see that it does not become greasy. The emery should be cleaned frequently with some fluid that will remove the grease. The

WEIGHT OF THE SLIVER

should be 65 grains per yard and the production for a week of 60 hours 750 pounds. As these yarns are carded they are put up at the drawing frame and run through three processes, the doublings being 6 into 1 at each process. The drawing frames may be equipped with metallic or leather top rolls. If the latter are used, keep the flutes clean; and if the former, see that the top rolls are always well covered and varnished. No matter which top rolls are used, it is important to see that the stop motions are all in perfect working order, especially those operating the spoons, for it is here a great deal of trouble is caused by single and double if they are out of order. The speed of

THE FRONT ROLL

should be about 350 revolutions per minute. The weight of the sliver at the front of the finisher should be 75 grains. This sliver is put up at the slubber and made into .60 hank roving. From the slubber it is put through one process of fly frames for the warp and filling yarns and two processes for the selvedge yarn. The hank roving being 2.25 for warp and filling and 1.50 for selvedge at the second intermediate, the hank roving for the latter yarn is 5.50. At these frames be sure that the top rolls are in good condition and that the traverse motion is working properly. The top rolls should be cleaned frequently, at least twice a week, and new rolls put in at regular intervals, these being determined by various conditions which are different in every mill. Never run loose, fluted, bruised or uneven top rolls. Watch to see that all

THE TENDERS

mark their roving correctly and that they do not let single and double go. Do not allow pieces to collect, but use them up as fast as possible. Keep floor of card room clean at all times, as nothing creates so poor an impression on a visitor as an untidy card room floor. From the card room the roving is taken to the ring spinning room and made into 14s warp on a frame having a gauge of three inches, diameter of ring, 2⅛ inches, length of traverse, 7 inches, twist per inch, 17.77, and spindle speed of 9,000 revolutions

per minute. The 10s filling yarn is made on a frame having a 2¾-inch gauge, 1⅝-inch diameter ring, 7-inch traverse, 10.28 twist per inch and spindle speed of 6,400 revolutions per minute. The selvedge yarn is spun on a frame having 2¾-inch gauge, 1¾-inch diameter ring, 6½-inch traverse, 25.13 twist per inch and spindle speed of 9,700 revolutions per minute. The warp yarn is put through a spooler and warper and from here put through a slasher. The selvedge is put through a spooler and then twisted, spooled again, and run on to a selvedge beam after being put through a slasher.

IMITATION GAUZE---Mock Leno.

These weaves are very extensively used in cotton manufacture.

The imitation of leno or gauze fabrics can be made extremely close; in some cases the deception has even imposed on experienced buyers.

These weaves are commonly used

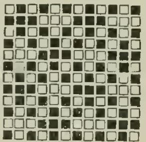


Fig. 1.

for such fabrics as dress goods, curtains, ladies' aprons, men's shirts, canvas cloth, etc. These fabrics are characterized by three or more warp threads and three or more filling picks interlacing with each other very loosely, while the following warp and filling threads form a complete break and so can readily be kept apart for small spaces.

In the warp these breaks are augmented by the reed by leaving one, two, three or more dents empty (if, for example, we use a plain six-harness imitation gauze weave, as shown in Fig. 1, ends one, two and three would be drawn in one dent, while ends four, five and six would fill another dent) and by leaving one, two or more dents empty between the first group of three ends and the second group of three ends. The number of dents to be left empty depends upon the space desired between each group of ends.

Diagram Fig. 2 shows the character of fabric woven with weave shown in Fig. 1.

A four and four, or five and five mock leno is based on the same principle as the three and three described above: in the four and four the ends are reeded four in one dent, while in

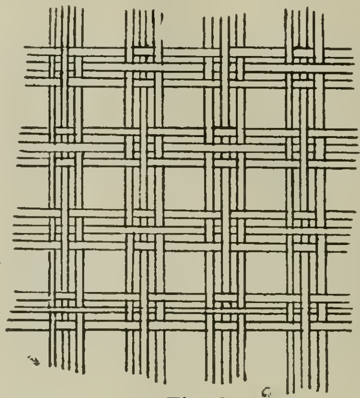


Fig. 2.

the five and five the ends are reeded five in one dent.

The four and four and the five and five end patterns produce a slightly more open effect than the three and three end pattern.

The former is also suitable for a finer make of cloth, as the open effect can be made with a larger number of ends per inch.

In the five and five end or ten-harness weave (see Fig. 3) the second, fourth, seventh and ninth ends serve to pull the picks together in fives and make a decided opening in the cloth between the fifth and sixth picks; in the pattern the same thing takes place with the ends—they are pulled together in fives by the second, fourth and seventh and ninth picks, and if two

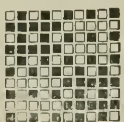


Fig. 3.

dents be skipped between each group of five ends it will produce the effect in fabric shown in Fig. 4. In addition to plain gauze fabrics, as shown in Fig. 2, these weaves are used in connection with plain woven fabrics in the form of a pattern (see Fig. 4) and also in the form of checks. The fabric shown in Fig. 4 shows a series of ends working gauze or mock leno throughout the entire pattern, forming a stripe through the entire length of the fabric. In the check effects these ends

are made to weave plain or otherwise as may be desired. Fig. 5 illustrates a mock leno three and three check pattern, showing 18 ends working gauze for 18 picks and the next 18 ends work plain for 18 picks, these two series of ends alternating into a plain weave at the end of the 18 picks. These check pattern fabrics in nearly all in-

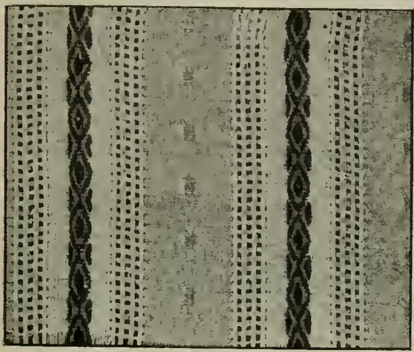


Fig. 4.

stances are given a wet finish. By reason of the fact that the warp is reeded three in one dent, skipping one, two or more dents between each three ends will cause the plain woven part of the fabric to show more or less streaky; that is, it will show each of the three ends lying close together instead of being evenly distributed across the fabric. When subjected to the wet finish these ends will take their proper places. When making a gauze stripe fabric as shown in Fig. 4, the ends operating the gauze weave are on a separate beam because of the difference of take-up in warp during weaving.

Another method of producing a mock leno is to have two ends appear as if they were twisted around several other ends, that is, not resting parallel to one another. This is readily produced by allowing the two ends to come together for two picks,then gradually spreading them for six or eight picks, then allowing them to gradually come together again for two picks. These two ends in the pattern are of coarser counts than the body of warp, usually a three-ply thread, and are on a separate beam from the body of the warp.

Fig. 6 shows design and reeding plan for a fabric of the above description.

ANALYSIS.

Width of warp in reed, 37½ inches; width of fabric finished, 36 inches; ends per inch finished, 68; reed 1,200; take-up of warp (ground warp) during weaving, 10 per cent; take-up of leno warp during weaving, 20 per cent.

DRESSING.

12 ends white.
8 ends blue.
6 ends white.
4 ends blue.
2 ends white.
2 ends blue.
10 ends white.
8 ends blue.
16 ends white.
1 end dark blue mercerized cotton.
8 ends white.
1 end dark blue mercerized cotton.
16 ends white.
8 ends blue.
10 ends white.
2 ends blue.
2 ends white.
4 ends blue.
6 ends white.
8 ends blue.

134 ends in pattern.

Ends in pattern: 88 ends white 1-40s; 44 ends blue 1-40s; 2 ends dark blue 3-30s; total, 134 ends.

Filling, 70 picks per inch 1-50s bleached cotton.

LOOMS REQUIRED.

These fabrics are mostly woven with but one color filling; consequently any ordinary harness loom would answer for weaving these fabrics. Competition and economy are factors that have caused the discarding of the old roller loom, using instead the Crompton and

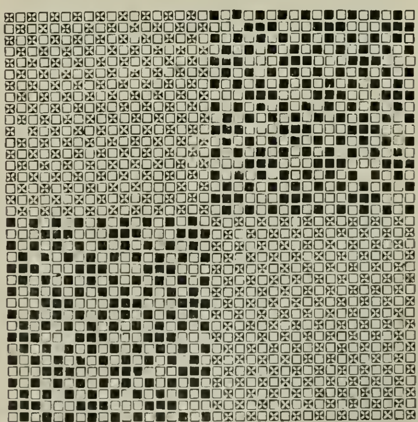


Fig. 5.

Knowles dobby or Ingham patent harness motion loom.

FINISHING.

These fabrics are sometimes given a dry finish, depending chiefly upon the weave and pattern. In some qualities in which only one color warp and filling is used, the fabric is bleached,

hot pressed, then made up into rolls ready for shipment. When two or more colors are used, the fabric in most cases is boiled off, then subjected to a light sizing, pressed, and then made up into rolls.

Carding and Spinning Particulars.

The yarns of which mock lenos are composed are made up in mills of the second division as given in a previous article. These yarns may be either combed or just carded, according to the grade of the fabric to be made. For the fabric under description in this article we will consider the filling yarn to be combed and the warp yarn to be carded. The filling yarn is made from an American cotton of 1 5-16-inch staple, while the warp yarn is made out of cotton of 1¼-inch, the cotton used for both purposes being of a good grade. Both cottons are generally mixed by hand, being kept in separate bins, of course. The mixings should be as large as possible,

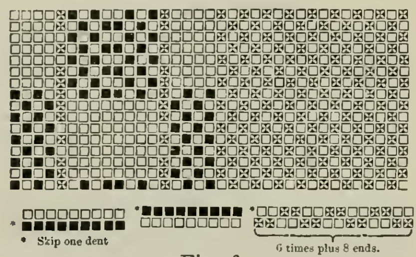


Fig. 6.

each batch being calculated to last at least a week.

A GOOD PLAN

to follow is to have a batch of the same stock always on hand drying out while one is being used. This insures a dry and fluffy cotton being mixed. At the mixing bins the good sliver waste from all machines up to the slubber is mixed in. This waste should be spread throughout the entire mixing and not, as is sometimes done, piled up in one place and fed to the opener all at once. The mixing is put through an opener and three processes of picking. Follow the rules that have been given in previous articles in connection with the opener. At the breaker picker the beater used is generally of a two-bladed, so-called rigid type and for both stocks makes 1,500 revolutions per minute. See that the beater is properly set to the feed rolls and that the grid and grate bars are properly spaced so that they will allow all foreign matter to drop through. Look out for all

THE DRAFTS

to see that they are properly directed to the best advantage to make a good, clean, even lap that does not split. The weight of the lap at the front of the breaker picker is 40 pounds. At the intermediate picker the speed of the beater (two bladed) is 1,450 revolutions per minute, and the total weight of the lap is 37 pounds or a 12-ounce lap for the 1 5-16-inch stock and a 10-ounce lap for the 1¼-inch stock. These laps are doubled four into one at the finisher picker. On this picker the speed of the beater is also 1,450 revolutions per minute. The total weight of the lap at the front is 35 pounds for the 1 5-16-inch stock and 39 pounds for the 1¼-inch stock, or a 13-ounce lap for the longer stock and a 14½-ounce lap for the shorter staple. The laps are put up at the card and the draft of the card for the warp yarn is not more than 95. The speed of the licker-in should be about 300 revolutions per minute. The top flats make one complete revolution every 50 minutes. The sliver weighs 65 grains per yard and the production for a week of 60 hours is 750 pounds. For the filling yarn the draft of the card should not be less than 110. The top flats make one complete revolution every 35 minutes, the speed of the licker-in being 300 revolutions per minute. The weight of the sliver is 55 grains per yard and the production 550 pounds for a week of 60 hours. The counts of the wire fillet used for all parts would be similar for carding both staples of cotton or 110s for cylinder and 120s for doffer and top flats. Strip three times a day and grind at least once a month. Always gauge the setting points after grinding and set to high places. Use

THE SETTINGS

given in a previous article on "Bedspreads." The sliver for the warp yarn is put through three processes of drawings, the doublings being 6 into 1, the speed of the front roll being 350 revolutions per minute at each process. A good weight for the sliver at the different processes is as follows: 77 grains at front of breaker, 76 grains at front of middle and 70 grains at front of finisher. Either metallic or leather covered top rolls may be used on this stock. Either one used will give good results if properly cared for. If leather-covered rolls are used, use one of the recipes

given in a previous article and don't use rolls that are not in perfect condition. If the damage is in the covering, send it to be recovered and always examine the returned rolls to see that they are level and have the right grade of sliver covering. Look out for all the knock-off motions to see that they are in perfect working order; for remember, that one of the two duties of a drawing frame is to even the sliver, and if the knock-off motions do not work they will allow single to go through, which is a serious fault that is not corrected while passing through the slubber where the end is put through single. The drawing sliver is put through the slubber and drawn into .60 hank roving. From here it passes through two processes of

FLY FRAMES,

the hank roving at the first intermediate being 2 for the 30s, and 2½ for the 40s yarn; at the second intermediate the hank roving is 6 for the 30s and 8.50 for the 40s yarn. These rovings are then spun on a ring frame into 30s and 40s yarn. For 30s yarn the frame, to get best results, should be fitted as follows: Gauge of frame, 2¾ inches; diameter of spindle, 1¾ inches; length of traverse, 6½ inches; twist per inch, 26.02,and spindle speed, 9,800 revolutions per minute. For 40s yarn use a 2¾-inch gauged frame, a 1⅝-inch diameter ring; 6½-inch traverse, 28.46 twist per inch and spindle speed of 10,000 revolutions per minute. The yarns are spooled and twisted, 3 ends of 30s being twisted together, and then 2 ends of the 3-30s twisted with 1 end of the 40s yarn. The yarns are then warped and slashed.

The card sliver for the filling yarn is generally put through a sliver lap, ribbon lap and then a comber. At the sliver lap the doublings are 14 into 1, the weight of a yard of lap being 280 grains per yard. These are doubled at the ribbon lap machine 6 into 1. The weight of the laps at the front of this machine is 265 grains per yard. These laps are put up at the comber and doubled according to the number of heads on the comber, either six or eight into 1. The particulars given for the sliver and ribbon lap machines are for an 8¾-inch lap.

AT THE COMBER

a percentage of 16 per cent should be taken out of the lap being fed. The settings should be the same as given in a previous article and this is true of the trimmings. As the combers are not equipped with stop-motions, single and double should be looked for, and it is a general rule, if two or more ends break down on the table, to break the sliver entering the can and to remove all single from can before piecing up end again. This rule should be rigidly enforced so as to prevent,as far as possible, single going to the drawing frame. Keep the leather detaching rolls in perfect condition as to covering and varnish. It is a good plan to varnish all detaching rolls at least once a week. Varnish leather covered rolls in draw box as often as necessary. Take percentages of at least six combers a day to see just what they are doing. The comber sliver is put through two processes of drawing. The speed of the front roll at each process is 350 revolutions per minute. A good weight for the sliver is 68 grains per yard at the breaker and 75 grains per yard at the finisher. The sliver is then put through the slubber and made into .50 hank roving. From here it is put through three processes of fly frames, the hank roving at each process being as follows: First intermediate 1; second intermediate 3, and fine 12 hank. This roving may be either mule or ring spun. If the latter, use a frame with the following particulars: Gauge of frame, 2¾ inches; diameter of ring, 1¼ inches; length of traverse, 5½ inches; twist per inch, 26.52, and speed of spindle, 8,200 revolutions per minute. The yarn is then taken and conditioned and is ready for weaving.

Dyeing Particulars.

AMBER.

One-half per cent diamine catechine G; 15 per cent Glauber's salt; 1 per cent sal soda; aftertreat with ½ per cent bichromate of potash; ½ per cent sulphate of copper.

SKY BLUE.

One-half per cent diamine sky blue F F; 15 per cent Glauber's salt; 1 per cent sal soda; aftertreat with ½ per cent sulphate of copper.

LIGHT PEA GREEN.

Six ounces diamine sky blue F F; 8 ounces diamine fast yellow F F; 10 pounds Glauber's; 1 pound sal soda; aftertreat with 1 per cent sulphate of copper.

PINK.

One-half per cent erika pink G; 10 per cent Glauber's salt; 1 per cent sal soda.

LIGHT SLATE.

Four ounces benzo fast black; 1-16 ounce chrysophenine; 5 pounds Glauber's salt; ½ pound sal soda.

PEARL.

Four ounces naphthamine black N; 5 pounds Glauber's; 1 pound sal soda; aftertreat with ½ pound bichrome.

NAVY.

Four per cent naphthamine blue 2 B; 20 per cent Glauber's; 2 per cent sal soda; aftertreat with 1 per cent bichrome; 1 per cent sulphate copper.

NAVY BLUE.

Two per cent diaminogene blue B B; 2 per cent diaminogene blue N A; 25 per cent Glauber's salt; 3 per cent sal soda.

Diazotize: Two and one-half per cent nitrite soda; 5 per cent sulphuric acid; turn for 15 minutes and rinse.

Develop: Dissolve 14½ pounds beta naphthol; 18 pounds soda lye at 77 degrees Tw.; 20 gallons boiling water; for 100 pounds yarn add 1½ gallons of developing solution, turn for 15 minutes, rinse and give a good soaping.

RED.

Six per cent primuline; 20 per cent Glauber's; 2 per cent sal soda; diazotize and develop as the navy blue.

LIGHT YELLOW.

Four ounces chromine G; 5 pounds salt; 1 pound sal soda.

GREEN.

Three per cent diamine green G; 3 per cent diamine fast yellow A; aftertreat with 3 per cent bichrome.

BLACK.

Fifteen per cent immedial black N N; 15 per cent sulphide sodium; 3 per cent soda ash; 30 per cent Glauber's salt.

FILLING REVERSIBLES.

Filling reversibles is a term given to a class of cotton fabrics used extensively in the manufacture of dressing sacques, kimonos, bath robes, etc. In cotton warp and shoddy or woolen filling goods the same principle of construction is adopted for goods for horse blankets, rugs, etc.

THE RESULT DESIRED

is to have a cloth containing two colors, each color being in solid blocks or effects, and to have one side the reverse of the other. In low-price goods this is obtained by a combination of weave, color and finishing.

Fig. 1 illustrates a cloth of this type showing solid blocks of brown and white running warp way. Where brown appears on the face, white appears opposite on the back. In this particular sample the white bar across the cloth shows white on both sides. Brown shows opposite white at all other places.

Fig. 2 illustrates the weave for cloth Fig. 1, being on 80 ends and 96 picks. Sections A correspond to brown sections on the face of the cloth, and sections B, indicated on picks marked White, to the white sections. The weave is really complete on eight picks, the coloring indicating the extent of the pattern.

In Fig. 2 the dots indicate the face weave, i. e., at these places the filling

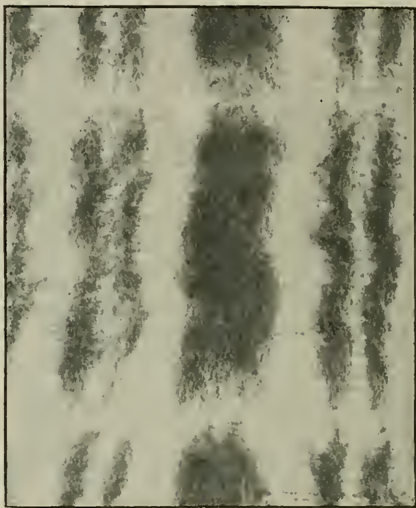


Fig. 1.

which is always considerably coarser than the warp, almost covers the latter. On account of the large number of picks as compared to warp, the relative sizes of the yarns and the peculiarity of the weave, the filling on the picks indicated by the dots comes together, covering the picks indicated by the crosses. The picks marked in crosses come together on the under side of the cloth.

In the section bracketed and indicated as containing 80 picks, the filling is picked two brown and two white alternately, making 40 brown picks on the face and 40 white picks on the back in sections A and the reverse colors in sections B. The fabric is really double in the filling and single in the warp.

Sections A form a left-hand twill on

the face and a right-hand twill on the back; sections B vice versa.

The construction of the fabric under consideration is 42 ends and 62 (31 face and 31 back) picks per inch finished. The warp is 15s and the filling 7½s. The latter contains very little twist. The warp is all white. The filling is two brown and two white for

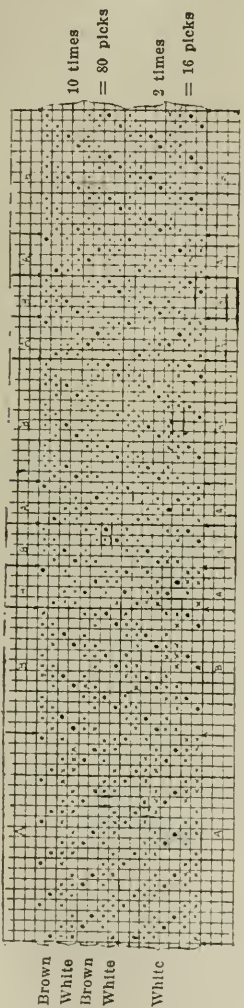


Fig. 2.

80 picks, 16 white; total, 96 picks per pattern. The width is 27 inches finished. The harness draft requires eight harnesses, four for sections A and four for sections B, in addition to two for selvedges. Reed 2 or 4 ends per dent. The chain draft is shown in Fig. 3. The box chain would be required to be built for 96 picks, and a loom with a repeater or multiplier motion would be the best to use.

LOOM REQUIRED.

The simpler types of filling reversibles can be woven readily on any ordinary dobby loom arranged with a two by one box motion. As the warp is hidden entirely after finishing, one warp only is required. On account of the coarseness of the filling, large shuttles are necessary. For rugs a jacquard head is usually used.

FINISHING.

Practically all the finishing these goods receive is in raising the fibre to form a nap. This nap entirely obliterates the weave effect. The soft-twisted filling is readily raised by the card wire of the cotton raising machines.

Carding and Spinning Particulars.

The mills that make the yarns of which filling reversibles are made, will be found in the first and second division of mills as given in a previous article. The filling yarn is slack twisted and for the fabric to be described is a number 7½ yarn. This is made from various stocks; sometimes only straight cotton is used, but more generally it is composed of a

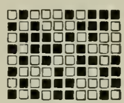


Fig. 3.

certain percentage of waste, sometimes as high as 60 per cent waste being used.

THE WASTE

used also differs, some using card waste, some comber and some both. It is generally safe to say if waste is used that it will be card waste, for the mills making this class of goods are not generally equipped with combers. The stock with which the waste is mixed is of from ¾ to 1 inch staple, according to the quality of the fabric required. A fine average staple to take is one of ⅞-inch length. The mixing would be done by hand and it is almost needless to state that large mixings should always be made for various reasons that have been given previously. The stock of which the warp yarn is made is ⅞ to 1 inch in length, generally the former length being used. While the stock for this yarn is sometimes mixed with waste,

THE PERCENTAGE

of waste does not run as high as that used for the filling stock. The stock

is put through three processes of picking, before which it passes through an opener. Keep the hopper of this opener well filled with cotton so that the fitting or spiked apron will always have a full load. The beaters generally used for the pickers for this class of goods are of the two-bladed rigid type and the speed of that in the breaker picker should be about 1,550 revolutions per minute. The weight of the lap at the front should be 40 pounds or a 16-ounce lap. These laps are doubled four into one at the intermediate picker. The speed of this beater for both warp and filling yarns is 1,500 revolutions per minute. The

WEIGHT OF THE LAP

at the front of this picker is 38 pounds or a 14-ounce lap. These laps are doubled at the back of the finisher picker four into one. The speed of this beater is 1,500 revolutions per minute, which gives the cotton passing through about 43 beats per inch. The total weight of the lap at the front of this machine is 39 pounds or a 14½-ounce lap. A variation of one-half pound either side of standard weight for lap is allowed. Those having more of a variation than this are put at the back of the finisher picker and run over again, although care should be taken not to run two of these laps at the same time, for this would be more than apt to throw the weight of the lap being made out. Look out for the direction of the air currents and see that an

EVEN AND UNIFORM LAP

is being made at the front. Do not fool with the lap weight adjustments too much, for too much is worse than not enough, for the former will keep the weight of the lap jumping all around, whereas the latter is more apt to get the same weight of laps. These laps are put up at the card where the draft should not be more than 90. The settings of the card used should be the same as those given in connection with the article on indigo prints, except that of the feed plate to the licker-in, which should be set just a trifle farther, longer than the length of the staple. The flats and doffer should be covered with No. 34s wire and the cylinder No. 32s wire fillet. The speed of the licker should be 350 revolutions per minute, while the flats should make one complete revolution every 55 minutes. The cards should be stripped at least

THREE TIMES A DAY

and an extra stripping would greatly improve the yarn, but is not generally done. The weight of the sliver is 65 grains per yard and the production is 975 to 1,050 pounds per week of 60 hours. This sliver is next put through two processes of drawing where the doublings are 6 into 1. The speed of the front roll is 400 revolutions per minute for each stock, the draft of the breaker frame is 5.25, the weight of the sliver being 72 grains. The draft at the finisher is 5.60, the weight of the drawing being 72 grains per yard. For this class of work either leather covered or metallic top rolls may be used. But the metallic top rolls are considered by many to have a great many advantages, one of the principal ones being that more production is turned out with the same speed of roll. No matter which top roll is used, they should be watched carefully to see that they are in perfect condition

FOR MAKING GOOD WORK.

It is also a good policy to watch the stop-motions, for it is these, if they are not in proper working order, that cause single to be made. The sliver for the filling yarn is made into .40 hank slubber roving, while that for the warp yarn is made into .50 hank roving. The filling yarn is put through one more process of fly frames and made into 1 hank roving, which is taken to the mule room and spun into 7½s, having a 2.80 twist per inch. The slubber yarn for the warp yarn is put through two processes of fly frames, at the first being made into 1 hank and at the second into 3½ hank. This yarn is then taken to the ring spinning room and spun into 15s on a frame having a 3-inch gauge; 2⅛-inch diameter ring; 7-inch traverse, 18 turns per twist and a spindle speed of 9,200 revolutions per minute. This yarn is then spooled, warped and then put through a slasher.

Dyeing Particulars.

HAVANNA BROWN.

Three per cent immedial brown R R; 3 per cent immedial cutch O; 6 per cent sulphide sodium; 30 per cent Glauber's salt; 3 per cent soda ash.

NAVY BLUE.

Eight per cent pyrol navy blue; 8 per cent sodium sulphide; 3 per cent soda ash; 25 per cent salt.

BOTTLE GREEN.

Ten per cent pyrol green B; 10 per cent sodium sulphide; 3 per cent soda ash; 25 per cent salt.

PEARL.

One-half per cent immedial black

N R T; 5 per cent salt; 1 per cent sodium sulphide; 2 per cent soda ash; 10 per cent salt.

SKY BLUE.

One per cent tetrazo brilliant blue 6 B; 2 per cent sal soda; 20 per cent Glauber's salt.

RED.

Five per cent primuline Y; 2 per cent sal soda; 20 per cent Glauber's.

Diazotize: 2½ per cent nitrite soda; 5 per cent spirits salt.

Develop: 2 per cent beta naphthol; 2 per cent soda ash.

SLATE.

One per cent immedial black N B; ¼ per cent immedial direct blue B; 20 per cent salt; 2 per cent soda ash; 2 per cent sulphide soda.

ECRU.

One-half per cent immedial yellow D; ½ per cent immedial cutch G; 1 per cent sulphide sodium; 1 per cent soda ash; 10 per cent salt.

BROWN.

Eight per cent katigen brown V; 2 per cent katigen yellow G G; 10 per cent sodium sulphide; 2 per cent soda ash; 30 per cent Glauber's salt.

HELIOTROPE.

Eight per cent thiogene violet B; 8 per cent sulphide sodium; 2 per cent soda ash; 30 per cent Glauber's salt.

BLACK.

Ten per cent immedial black N N; 10 per cent sulphide sodium; 3 per cent soda ash; 30 per cent salt.

PINK.

One per cent erika pink; 3 per cent sal soda; 20 per cent salt.

DHOOTIES.

Dhootie cloths are a class of fabrics used very extensively in Zanzibar, Africa, Egypt and India, for scarfs, turbans, and girdle or body cloths.

They vary in width from 18 inches to 50 inches, and in length from two to six yards. The cut lengths vary from 12 to 40 yards.

They are distinguished by gaudy, highly colored borders, running lengthwise, and headings running across the piece between which both warp and filling yarns are of gray, white or other light color. Both sides of the cloth are similar, the fabric being reversible. The borders lengthwise range from about one-half inch to four inches in width.

THE REAL DHOOTIE

is a native eastern hand-woven fabric, in which the colored filling interlaces only with the border warp yarns. To weave such a fabric the services of three persons are required, one to take care of the centre and one for each of the borders.

It is practically the only article of apparel used by many of the poorer classes in the eastern countries.

Referring to these goods an Indian textile journal states that the following are standard sizes: 22 inches to 23 inches wide, 2 yards long; 24 inches to 25 inches wide, 2½ yards long; 26 inches to 28 inches wide, 3 yards long; 29 inches to 32 inches wide, 3½ yards long; 29 inches and upwards wide, 4 to 5 yards long.

THE YARNS

employed vary from 30s to 40s in the warp, and from 36s to 60s in the filling.

A great many of the goods are made with 34s warp and 40s filling in the centre of the goods, the borders being about 2-50s and 2-60s.

Although not usually the case, they are sometimes made with several colored stripes in the width of the piece, in addition to those forming the borders.

The cross borders, or headings, are sometimes very elaborate, varying in length up to about 20 inches. In the longer types these headings are inserted every few inches, whereas in the shorter types they are woven only at the beginning and end of each scarf. The

BORDERS AND HEADINGS

are intended to be made so that the colors of which they are composed will appear as prominent or solid as possible. To accomplish this on the side borders the method usually adopted is to arrange the colors in the warp yarns, and crowd them in the reed so that they will cover the filling as nearly as possible. In this class of dhooties the filling is of the same color as the warp of the centre of the goods. This filling necessarily shows to a greater or less degree in the borders and is regarded as an objectionable feature.

When weaving the better grades of goods, those nearly approaching in appearance the native hand-made goods, another method is adopted to make the prevailing color in the borders, usually red, as bright as possible. They are made on a loom containing three shuttles, one of which is a fly shuttle and carries the filling for

the centres of the cloth; the other two are small shuttles, made to work on one of the positive motion principles, as on narrow ware looms. These two shuttles

WORK ON OPPOSITE SIDES

of the loom and interweave only with the warp yarns constituting the borders. The small shuttles cross the ends at the same time as the fly shuttle, so that the amount of production is not affected either way by them.

Three filling forks are used, one for each shuttle, so that if any of the fillings break, the loom is stopped instantly.

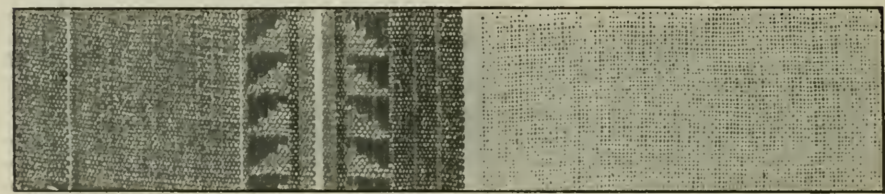
The border shuttles run in a different plane, and move in the opposite direction to the fly shuttle, so that only one pick of filling passes in front of the filling forks on the pick required to actuate the stop-motion. Catch threads are used to connect the borders and centres.

LOOM REQUIRED.

For plain dhooties, in which the borders as well as the centres weave plain, an ordinary single box loom is used,unless cross borders are required, when a box motion becomes necessary. In England, where these goods are extensively manufactured, side cam, revolving box looms are usually used.

For the better grades, where the borders are interlaced with colored and the centres usually with white or gray filling, a loom of a special type, previously referred to as having positively acting and fly shuttles, is used. This contains a dobby or other head motion.

Whether for low or high grades, plain or fancy, the border warp yarns are usually run from small rollers or spools, on account of being reeded differently, and are often of different counts from the centre yarns.



When the goods are required to be made with colored headings, the box motion of the loom is actuated to insert different colors of filling as may be necessary, the loom weaving the cross borders, or headings, and centre automatically. If a fringe is desired, it is made in the usual manner.

The figure illustrates one border and part of the white centre of a cheap dhootie cloth, in which the white filling interlaces with both centre and border.

The border is 2 5-16 inches wide and contains five colors, red, green, yellow, white and orange. The outer stripe of red is 1 3-16 inches wide. The count of the centre cloth is 52x46, and is reeded two ends per dent. The fancy weave portion is arranged one end of green and one end of red, alternately, and is reeded five ends per dent. The remainder of the border is reeded four ends per dent. With the exception of the 32 ends working as extra warp the weave of the fabric is plain. Eight white ends working as four divide the border from the centre. The border ends are ply yarns. The centre ends and the filling are single.

Carding and Spinning Particulars.

The yarns of which dhooties are made would be manufactured in mills having the equipment of machinery found in the second division of mills as given in a previous article. The dhootie which is taken for an example will be supposed to be composed of 34s warp and 40s filling for the centre and 2-60s for the borders. These yarns are made from the following cottons: The 2-60s is made from 1⅜-inch American cotton and is combed. The 40s and 34s are made from a 1 3-16-inch staple American cotton and may be

EITHER COMBED OR CARDED.

For this article we will consider that they are carded, but as it is desirable that the yarn shall be as free as possible from neps the speeds and settings of the card will be different from those generally used for this count of carded yarn. All three cottons may be either mixed by hand or by machine; the advantages of machine mixing (by means of a bale breaker) have been already previously given. Each mixing should of course be in separate bins and as large as possible, so as to

cause as little variation as possible in the finished yarn. It is also an important point to see that the different bales are intermixed. The cottons are put through an opener and three processes of

PICKING MACHINERY.

The good waste is mixed in with the raw stock as it is collected, but care should be used to scatter the waste, so that it will be evenly divided all over the mixing. The hopper of the opener should be kept full of raw stock all the time for reasons given in previous articles. The cotton should leave the opener and be delivered on the lattice apron of the breaker in a fluffy state, and if the hopper has been kept full all the time it will also be fairly even, i. e., if each yard of cotton passed to the feed roll is weighed, a great deal of variation will not be found. The beaters of the pickers used for this class of goods are generally of the rigid two-bladed type, although a great many are using the pin beater. When the latter is used, it does not require as high a fan speed as the rigid form of beater; this is due to its wide arms, and as it has three of these, it makes

CONSIDERABLY MORE DRAFT

than the two-bladed type of beater.

The speed of the beater for 1 3-16-inch stock for this class of goods is 1,550 revolutions per minute, and for the 1⅜-inch stock is 1,450 revolutions per minute. The total weight of lap at the breaker is 40 pounds for all staples or a 16-ounce lap. These laps are put up at the intermediate picker and doubled 4 into 1. The speed of the beater of this machine is 1,475 revolutions per minute for 1 3-16-inch stock and 1,425 for 1⅜-inch stock. The total weight of the lap is 37½ pounds or a 12-ounce lap for 1⅜-inch stock, and a 10-ounce lap for 1 3-16-inch stock. These laps are put up at the finisher picker and doubled as before, 4 into 1. The speed of this beater is 1,475 revolutions per minute for 1 3-16-inch staple, and 1,400 revolutions per minute for 1⅜-inch staple. The total weight of the lap is 39 pounds for 1 3-16-inch staple stock and 35 pounds for 1⅜-inch staple. A variation of half a pound either side of standard weight is allowed. All finished laps that vary from their standard weight more than this are put back and run through the finisher picker again. At this machine tne cut roving waste is also mixed in. Sometimes this is done by taking out two laps at the back, the two middle ones, and the cut waste spread evenly over the space thus made. It is

A BETTER METHOD

to use a roving waste picker, as then all the twist is taken out of the roving. After passing through this roving picker the cotton is made into a lap at the breaker or intermediate machine and is then put through the finisher picker, when it is used as follows: three laps of raw stock to one lap cut roving waste. The weight per yard at the front of the finisher picker is as follows: for 1⅜-inch stock, 12½ ounces; for 1 3-16-inch stock, 14 ounces yer yard. The cotton next passes to the card. The cards for all lengths of staples will be set alike for reasons previously given. Set doffer to cylinder with 5-1,000ths-inch gauge. Set under screen as follows: at licker-in with 12-1,000ths-inch gauge; middle to 34-1,000ths and front ¼ of an inch. Licker-in to cylinder with 7-1,000ths of an inch. Licker-in screen to licker-in, 3-16ths of an inch. Set bottom licker-in knife with 5-1,000ths gauge, top knife to 10-1,000ths of an inch gauge. Set feed plate to licker-in to 7-1,000ths of an inch gauge, and top flats to 12-1,000ths of an inch gauge. The speed of the licker-in should be 300 revolutions per minute. The flats make one complete revolution every 40 minutes for all stock. The production should be 500 pounds for 2-60s yarn and 600 pounds for the other yarns. Cards should be stripped three times a day and ground at least once a month, when the grinders should be allowed to stay on at least half a day. The cards should be reset after grinding. Special care should be taken to see that the top flats are sharp and are ground evenly and do not have more taken off the toe than the heel, as is generally the case unless great care is taken. The weight of the sliver is 50 grains per yard for each staple. After passing the card

THE PROCESSES

of the stocks differ. We will first follow the course of the carded staples. These are put through three processes of drawing, the front roll speed at each process being 350 revolutions per minute. The weight of the sliver at the front is 70 grains per yard. Great care should be taken to see that the stop-motions are in perfect working order, otherwise a great deal of trouble will result in single and double. At the slubber the sliver is made into .60 hank roving. This roving is then put through two processes of fly frames. At the first intermediate it is made into 2 hank roving and at the second into 7 hank for the 34s warp and 8 hank for 40s filling.

The card sliver for the 2-60s yarn is combed and the general sequence of processes is as follows: Sliver lap machine, where it is doubled 14 into 1 and has a draft of about 2; a yard of lap at the front weighing 300 grains per yard for an 8¾-inch lap. Six of these laps are put up at the ribbon lap machine and made into a 260 grain lap at the front. Keep top leather rolls in good condition and well varnished. Six laps from the ribbon lap machine are put up at the comber, if it is a six-head machine, or eight laps if it is an eight-head machine,and the weight of the finished sliver is 45 grains per yard. The

SPEED OF THIS COMBER

is 90 nips per minute, the per cent of waste taken out being 16. Keep the detaching rolls well varnished, recipes for which have been given in previous articles as well as a means for keeping the laps of the leather from splitting. After passing the comber the sliver is put through two processes of leather covered top roll drawing frames, the doublings being 8 into 1 at the breaker and 6 into 1 at the finisher. The weight of the sliver at the finisher drawing is 70 grains per yard. This is made into .50 hank roving at the slubber and is then put through three processes of fly frames, the hank roving at each being as follows: First, 1 hank; second, 3½ hank, and fine frame, 12 hank. This is then taken to the ring spinning room and spun into 60s on a frame with a 1¾-inch diameter ring, 5-inch traverse, and a spindle speed of 8,000 revolutions per minute; after which it is doubled into 2-60s. The roving for the 40s filling is spun on a ring frame having a 1⅜-inch diameter ring, 5½-inch traverse and a spindle speed of 8,800 revolutions per minute, and then spooled and warped and put through a slasher. The roving for warp is spun into 34s on a warp spinning frame with a 1⅝-inch diameter ring, 6½-inch traverse, and a spindle speed of 10,200 revolutions per minute, after which it is taken to the conditioning room.

Dyeing Particulars.

BLUE.

Three per cent immedial indone B; 2 per cent immedial indone 3 B; 5 per cent sodium sulphide; 2 per cent soda ash; 30 per cent Glauber's.

GREEN.

Five per cent immedial yellow D; 5 per cent immedial indone B; 10 per cent sodium sulphide; 3 per cent soda ash; 30 per cent Glauber's.

RED.

Six per cent primuline; 30 per cent Glauber's; 2 per cent sal soda, rinse; diazotize: 2½ per cent nitrite soda; rinse; develop: 2 per cent beta naphthol, rinse and soap at 150 degrees F.

YELLOW.

Mordant with tannine and tartar emetic, rinse; dye with 3½ per cent thioflavine T and rinse.

LIGHT GREEN.

Dye yellow with thioflavine T; and dye on top with 2 per cent brilliant green Y; rinse and give a weak soaping.

ORANGE.

Dye with 6 per cent primuline aftertreat with ½ degree Tw. solution of chloride of lime.

LIGHT BROWN.

Four per cent thion orange N; 4 per cent sulphide soda; 2 per cent soda ash; 30 per cent Glauber's salt; aftertreat with 2 per cent sulphate of copper.

MYRTLE GREEN.

Eight per cent thion green G; 2 per cent thion yellow G; 2 per cent thion green B; 10 per cent sulphide soda; 3 per cent soda ash; 25 per cent salt.

WINE.

Eight per cent thiogene red O; 8 per cent sulphide soda; 3 per cent soda ash; 25 per cent salt.

BLUE BLACK.

Ten per cent immedial brilliant black B; 10 per cent sulphide soda; 3 per cent soda ash; 25 per cent salt.

UNEQUALLY REEDED STRIPES

Under the above heading may be included an extensive type of cotton fabrics, variously known as satin or sateen stripes, doria stripes, etc.

They are made in all grades, from medium to fine, and used for many purposes, such as dress fabrics, curtain hangings, etc., and are usually shown in all white or solid colors.

They are characterized by prominent stripe effects which appear to stand up from the ground of the cloth.

The raised stripes are produced by crowding more ends in a given space than are contained in an equal space occupied by the ground ends and by weaving them differently. As a rule

the yarns forming the raised stripes are woven in satin or twill order, warp flush weaves, while those forming the ground weave plain.

Theoretically, warp ends weaving plain should take up or contract in length faster than ends weaving twill or satin, on account of the greater number of interlacings. This applies to cloths in which each dent contains the same number of ends throughout the entire width of cloth.

It has been found in practice that when weaving a fabric containing sections reeded, say, two ends per dent, and others four or five ends per dent, the yarns that are crowded in the reed will contract more than those reeded two ends per dent. For example, a

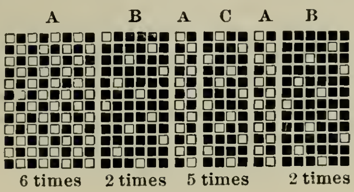


Fig 1.

warp stripe interlaced in five ends satin order and reeded five ends per dent would contract in length about as fast as the yarns weaving plain in the same fabric, if the latter were of the same counts of yarn and reeded two ends per dent. This fact explains the reason why satin stripe fabrics are usually woven from one beam.

A characteristic weave is shown in Fig. 1.

The warp lay-out of one repeat of the pattern is as follows:

Ends.	Dents.	Harnesses.	
48	24	1 to 6	
12	2	7 to 12	
2	1	1 and 2 }	
4	1	13 to 16 }	5 times.
2	1	1 and 2	
12	2	7 to 12	

Selvedges on harnesses 1 and 2.

The chain draft is shown in Fig. 2.

In Fig. 1 sections A weave plain, sections B weave 6 end warp satin, and sections C weave broken crow, warp face.

When combining weaves in this manner one of the principal points to consider is to bring the warp float of one section opposite the filling float of the adjoining section, or, as it is termed, they should be made to "cut" each other as well as possible. When this is done, the stripes have a more distinct and cleaner cut appearance than when it is ignored.

The construction data of the sample under consideration are: warp, 45s; filling, 40s Egyptian; finished width, 28 inches; width in reed, 29.9 inches; ends in warp, 2856; sley reed, 76. This represents the proportional number of ends per inch in the plain section. Average sley, 102. This indicates the average number of ends per inch in the entire width of cloth. Picks per inch, 80.

These goods may be woven on a single box dobby loom, the warp yarns being of one count, and one filling only being required.

The fabrics are found in many variations of patterns and qualities, and are subjected to suitable methods of finishing, according to the use to which they are intended to be put.

Carding and Spinning Particulars.

The mills that make unequally reeded stripes will be found in the second division, and while the count of yarn varies to a great extent for this class of goods, a good average count would be 45s warp yarn and 40s filling. It is not our intention to say much about the cotton warp yarn otherwise than a few general remarks, i. e., that the yarn is of 1¼ to 1⅜ inch American stock and carded, the hank rovings being as follows: for the slubber .55 hank, first intermediate, 2.50, and for the fine fly frame 10 hank, and is ring spun into 45s yarn. Further particulars for making this count of yarn may be found in previous articles dealing with the same length of stock and

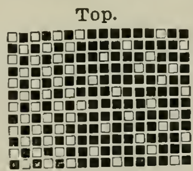


Fig 2.

making counts of yarn from 35s to 50s. In this article it is our intention to deal with

THE FILLING YARN

which is made from Egyptian cotton of 1⅜-inch staple. On account of its peculiar nature Egyptian cotton is especially adapted for filling yarns and it is a general custom to make the filling yarns of this kind of cotton, although it is not done in all styles of fabrics, and while the filling yarns of fabrics previously described might equally as well have been made out of Egyptian cotton, still for some special reason the kind of cotton given for filling yarns has been selected. The Egyptian bale is about 300 pounds heavier than the American bale, so

that so large a number will not be required in the mixing, which may be done by hand or by the use of a bale breaker. It will also be found that Egyptian cotton is much more easily handled than other kinds of, cotton. By this we mean that it gives less trouble to operate it at the different processes. The mixing should be made in the same manner as described in previous articles. The cotton for this stock is put through three processes of picking and an opener. The beater used at each process is generally the two-bladed rigid type. The

SPEED OF THE BEATER

at the breaker picker is 1,450 revolutions per minute; at the intermediate picker 1,375 revolutions per minute, and at the finisher picker 1,200 revolutions per minute. The total weight of a lap at the breaker picker is 40 pounds or a 20-ounce lap; at intermediate picker, 38 pounds or a 12-ounce lap, and at the finisher picker, 35 pounds or a 12½-ounce lap. The instructions given in previous articles for picking should be followed. At the card the draft for this stock should not be less than 120. The flats should make one complete revolution every 30 minutes, and the speed of the licker-in should be about 300 revolutions per minute. The weight of the sliver at the front should be 45 grains and the production for a week of 60 hours should be not more than 500 pounds. The setting points should be set to the same gauges as given in last article, while the particulars given for grinding, cleaning, stripping and oiling that have already been given for the same length of staple of American stock may be used. Egyptian cotton is easily combed and,as one overseer puts it, might be combed with a rake; still considerable care should be given to it to see that it is properly done. The particulars for sliver lap machine, ribbon lap machine and six-head comber for an 8¾-inch lap are as follows: Sliver lap machine doubles 14 into 1 and weight per yard of lap is 295 grains; at the ribbon lap machine the doubling is 6 into 1, the weight per yard being 260 grains; at the comber the doubling is 6 into 1, the weight of the silver is 47 grains. The percentage of waste taken out at the comber for this stock for fabric named is 16. Use settings and turnings given in a previous article.

THE COMBER SLIVER

is next put through two processes of drawing, the weight per yard at the front being 70 grains per yard with doublings of 6 into 1 at each process. Use either metallic or leather top covered rolls, this stock running equally well on each. At the slubber the sliver is made into .50 hank roving and from here it passes through three processes of fly frames, the hank roving at each being as follows: First intermediate, 1 hank; second intermediate, 3 hank, and fine frame, 10 hank. The twist gear used at each process should be one tooth smaller than that used for the same hank of roving made from American cotton. Watch the rolls, both top and bottom, to see that they are properly set. After leaving the fine frame the roving may be either mule or ring spun, sometimes one and sometimes the other being preferred for certain reasons. For this fabric the roving is generally ring spun. For spinning 40s filling yarn of 1 5-16-inch staple Egyptian cotton use a frame with a 2¾-inch gauge, 1½-inch diameter ring, and a 5½-inch traverse, and spindle speed of 8,800 revolutions per minute.

Dyeing Particulars.

PEARL.

Four ounces immedial black N R T; ½ per cent sulphide sodium; 1 per cent soda ash; 10 per cent Glauber's.

SLATE.

One per cent diamine black B H; 4 ounces diamine fast yellow B; 1 per cent sal soda; 20 per cent Glauber's salt.

FAWN.

One per cent diamine fast yellow B; 4 ounces diamineral brown G; ½ ounce diamine brown B; 1 pound sal soda; 20 per cent Glauber's.

SCARLET.

Five per cent diamine scarlet B; 2 per cent sal soda; 30 per cent Glauber's.

RED.

Four per cent diamine fast red F; 2 per cent sal soda; 30 per cent Glauber's.

MYRTLE GREEN.

Four per cent benzo green G G; ½ per cent chrysophenine; ½ per cent benzo fast black; 3 per cent sal soda; 30 per cent Glauber's.

HELIOTROPE.

Two per cent tetrazo lilac B; 2 per cent sal soda; 25 per cent Glauber's.

LIGHT BROWN.

Two and one-half per cent diamine brown 3 G; 2 per cent sal soda; 25 per cent Glauber's.

DARK BROWN.

Three per cent diamineral brown G;

½ per cent diamine brown M; 1 per cent diamine catechine B; 2 per cent sal soda; 30 per cent Glauber's.

NAVY BLUE.

Six per cent diamine dark blue B; 2 per cent sal soda; 25 per cent Glauber's salt.

WINE.

Five per cent diamine Bordeaux B; ½ per cent diamine fast red F; 3 per cent sal soda; 30 per cent Glauber's.

PINK.

One-half per cent Erika pink G; 1 per cent sal soda; 10 per cent salt.

SKY BLUE.

One per cent diamine sky blue F F; ½ per cent sal soda; 15 per cent Glauber's.

BLACK.

Ten per cent immedial black N N; 2 per cent soda ash; 10 per cent sodium sulphide; 30 per cent Glauber's.

STOP PEG CHECKS.

The above term is used in cotton mills to indicate a type of fabric extensively made for dress goods and decorative purposes. In the dry goods trade the goods are found under various names.

They are an extension of the type of goods, unequally reeded stripes, explained in the last article,and are characterized by certain yarns in both warp and filling appearing to stand up from the ground cloth in regular or irregular block effects. They are usually woven white and bleached or dyed as may be required.

This article is really supplementary to the last one, the points referred to there applying equally as well here.

A check is almost always formed by a crossover effect in the filling in connection with a distinguishing stripe in the warp. If the effect warp way is not as prominent or more prominent than the effect filling way, a barry pattern is produced, objectionable in almost all classes of textile fabrics.

In stop peg checks the effect warp way is formed by crowding some of the ends and weaving them in a different manner from the others, as in unequally reeded stripes. The effect filling way is formed by interlacing the yarns in a certain manner, say plain, for a certain number of picks, then changing the order of interlacing to another weave, say a filling sateen, for a definite number of picks.

When weaving the plain section, the take-up motion of the loom works in the ordinary manner, whereas when weaving the filling satin section it is disconnected, as required, so that more picks will be inserted in a given space.

The device used for disconnecting the take-up motion is usually connected to one of the levers of the dobby and called into action by pegs placed in the pattern chain; hence the term, stop peg checks.

A friction let-off is preferable to a positive let-off motion for this class of goods. Fig. 1 illustrates an example of the simpler type, consisting of sections of plain, warp sateen and filling sateen. The analysis of the sample under consideration shows the following data: Warp, 60's; filling, 90's; cloth width, 27.5 inches. In the plain sections there are, in proportion, 72

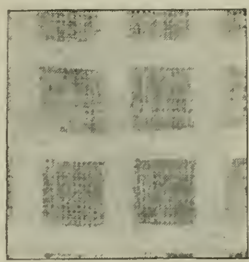


Fig. 1.

ends and 72 picks per inch. The average number of ends and picks per inch is 114 each.

The warp lay-out for one pattern is as follows:

Ends.	Dents.		
24	12	=	2 ends per dent
30	5	=	6 ends per dent
24	12	=	2 ends per dent
30	5	=	6 ends per dent
108	34		

One warp only has been used.

The harness draft is shown at Fig. 2.

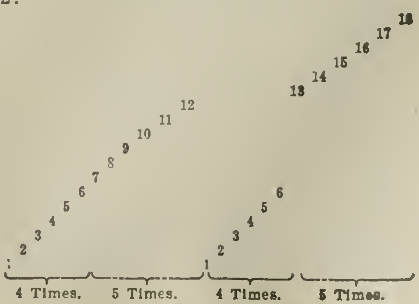


Fig. 2.

The chain draft, exclusive of selvedge, is shown in Fig. 3. In this figure marks \ correspond to the plain sections in the cloth; dots correspond to the warp satin sections in the cloth; circles correspond to the filling satin sections in the cloth; crosses correspond to the filling satin sections in the cloth where the same cross over the ends crowded in the reed, this is a filling satin with two picks in a shed; marks / correspond to the warp satin sections in the cloth where the same cross over the picks forming filling satin with the otherwise plain ends; solid marks indicate stop pegs.

Fig. 3.

The warp satin sections are woven two picks in a shed when the other sections of ends are weaving filling satin. On these picks the take-up motion is out of connection on 20 out of 30 picks, the entire 30 picks occupying only as much space as 10 picks in the plain sections.

The positions of the stop pegs cannot always be determined before the cloth is being woven. When a change is made from plain to filling satin it is not necessary to insert stop pegs for a few picks because the picks go in easier in the filling satin sections.

LOOM REQUIRED.

An ordinary single box dobby loom fixed with device referred to may be used when weaving these goods. One warp only is required.

Unequally reeded stripes and stop peg checks may be placed in the novelty class, being in demand one season and out of demand the next; also on account of varying considerably in pattern and quality. As such they are usually woven on looms fitted up for weaving from two or more warp beams.

Carding and Spinning Particulars.

The yarns for stop peg checks are made in mills of the second and third divisions of mills as given in a previous article. The counts of yarn used for this fabric differ according to the quality of the fabric desired, and for the carding and spinning particulars we will consider the sample to be made up of 60s warp and 90s filling yarns. Both of these counts of yarn will be combed, the warp yarn being made from 1⅜-inch Allen or peeler cotton and the filling yarn from either Egyptian of 1½-inch staple or, as is more general, from Sea Island cotton of 1⅝-inch staple. The processes used for the Sea Island cotton will first be described, and as the processes for 1⅜-inch American cotton have already been described only those points that differ from those already explained will be given. In mixing Sea Island

cotton a great deal of care should be taken to see that all bales put into the mixture staple the same. At the mixing bins the good sliver and picker waste from the machines up to the slubber will be mixed in. As

SEA ISLAND COTTON

has to be handled as little as possible, on account of the ease with which neps are put in, generally only one process of picking and an opener is used, although some mills use two processes. If only one process is used, the speed of the beater should be just high enough to beat out the dirt, and this varies according to the grade and quality of the raw stock. For a fair average a two-bladed rigid type of beater should make about 1,200 revolutions per minute, which will give the cotton passing through about 29 beats or blows per inch. The lattice apron of this machine is measured off and marked into yard spaces, and the cotton as it comes from the apron is weighed and spread evenly over this space. The lap at the front end weighs 30 pounds or a 10-ounce lap per yard. A variation of only six ounces either side of standard weight is allowed for this cotton. At the card the same care is taken to prevent neps and the speed of certain parts is changed to help this result. The speed of the licker-in is reduced about 50 revolutions per minute from that when American cotton is used. The

SPEED OF THE FLATS

is increased to make one complete revolution every 35 minutes; the flats are also set to a No. 10 gauge instead of a No. 12, as compared with American cotton. The cylinder and doffer are only stripped twice a day, but the card wire is always kept sharp and in perfect condition. The weight of the sliver at the front is 45 grains per yard and the production for a week of 60 hours should not be over 400 pounds per week. The sliver is next taken to the sliver lap machine or in some cases a drawing frame is used first and a sliver lap machine afterwards. If the former method is used, the weight of the lap should be about 230 grains per yard, the doublings being 14 into 1 for an 8¾-inch lap. These laps are doubled at the ribbon lap machine 6 into 1, the weight of the lap at the front being 220 grains per yard. If a drawing frame is used after the card, the ribbon lap machine is not used, and the weight of lap at the sliver lap machine should be 220 grains per yard. The laps at both the ribbon and sliver lap machines should be sized once a day. The laps are next put up at the comber and doubled according to the number of heads that it contains, either six or eight. The percent of waste taken out at this machine for this stock varies according to the overseers' ideas, but a good average percent is 22.

THE WASTE PERCENTAGE

should be taken from six different combers every day. Keep the rolls well varnished and other parts well polished and as free from dirt as possible. Watch the piecing and also for single. Keep your setting points to gauge and time. The sliver at this machine weighs 35 grains. This sliver is put through two processes of drawing frames, the revolutions per minute of front roll being 320, the doublings 6 into 1 at both processes, and the weight of sliver at the finisher being 60 grains per yard. Follow instructions given for drawing frames in previous articles. The sliver at the drawing frame should be sized 4 times a day,and a variation of only one grain per yard allowed. The drawing sliver is next put up to the slubber and made into .80 hank roving, after which it is put through three processes of fly frames, the hank roving at each being as follows: First intermediate, 2.25 hank; second, 5 hank, and fine, 18 hank. At the fine frames the roving is sized once a day. The usual care that has been previously explained should be given to all parts of the fly frames, and in addition the top leather rolls of the slubber should be varnished. It is best, but not always convenient, to have the slubber rolls used of a little larger diameter than when other cottons are used. This is on account of the length of the staple, to help prevent "licking." The roving is next spun, either a ring frame or mule being used, generally the latter. If a ring frame is used, the gauges should be as follows: For 90s yarn from this stock, 1¼-inch diameter ring, 5-inch traverse, 31 turns per inch and a spindle speed of 7,400. After being conditioned, the yarn is ready to use. For the warp yarn use the particulars given in the article on dhooties, except that the yarn is not twisted. A good size mixture for slasher is as follows: Water, 100 gallons; potato starch, 54 pounds; Yorkshire gum, 2 pounds; white soap, 1½ pounds.

SUSPENDER WEBBING.

Suspender webbing is, as the name implies, used for suspenders. It is of two types, elastic and non-elastic. The non-elastic type is made into suspenders in connection with elastic straps connected to the buckles. An advantage claimed for this webbing is that there is no friction on the clothing at the shoulders, the rubber at the front and back, on the part between the buttons and the buckles, taking care of variable tensions caused by the different movements of the body.

Being subjected to hard usage, the goods are made firm in the loom, of strong materials. They are of varying grades and qualities. In width they vary from 1 to 1¾ inches.

The analysis of a cotton webbing of a cheap grade shows the following data: warps, 117 ends of 2-40s cotton for face and edges; 50 ends of 2-20s for back; 24 ends of 2-30s for binders or stitchers; 25 ends of 42 rubber.

There are 90 picks of 2-16s filling per inch, finished. As these goods are held tight in the loom on account of the rubber warp, 60 picks per inch only would be put in in the loom, the webbing contracting 50 per cent in length after being woven.

The width of the web is 1 7-16 inches.

The full layout is shown in the harness draft, Fig. 1, the various warps being drawn as follows: binder ends through harness No. 1, rubber ends through harness No. 2, face and edge ends through harnesses Nos. 3, 4 and 5, and the back ends through harnesses Nos. 6 and 7. The daggers indicate where the ends are divided by the reed, the entire web occupying 27 dents of a reed containing 17 dents per inch.

Each binder end works between two back ends. To add bulk to the fabric, coarse ends are sometimes inserted in the centre of the cloth; these are drawn through the same harnesses as the rubber.

The chain draft is shown in Fig. 2. By comparing Figs. 1 and 2 it will be seen that the web is a multiple or compound fabric, all face ends being raised when back picks are inserted, all back ends depressed when face picks are inserted, all rubber ends raised on back picks and depressed on face picks, thereby being between the face and back fabrics.

The binders tie the fabrics into one compound fabric.

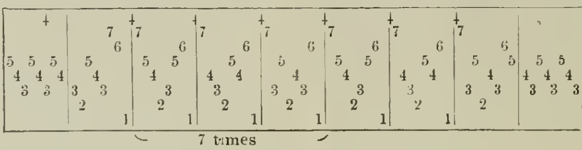


Fig. 1.

LOOM REQUIRED.

Suspender looms are made with more or less attachments according to requirements. They are capable of running upwards of 40 webs at the same time, so the production of one loom is considerable. The shuttles, one for each web in the simpler type, are actuated on the rack and pinion principle in a positive manner. On some goods, where silk filling is used for figuring purposes, three or four shuttles are required for each web.

Goods like the one under consideration would be woven on a positively acted side cam loom, actuated by interchangeable sectional cams. The cams are 12 picks to the round or repeat. One shuttle only is required for each web.

For more elaborate goods a dobby or jacquard head is used in connection with the cams, the latter working the harnesses for the ground, and the head motion actuating the figuring yarns.

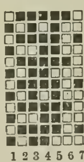


Fig. 2.

Separate warp beams, or spools, are required for each different count of warp yarn, for each web.

Carding and Spinning Particulars.

Like other fabrics that have been already described in these articles, the yarns of which the webbing for suspenders is made vary as to

count, but in this especial case there is also a wide range of the stock used and also as to whether it shall be carded or carded and combed. The higher grades of webbing are composed of the longer stapled cottons, even the longest staple Sea Island cotton being used for the very fine grades, this cotton being of course combed, and from this down to the short stapled carded cotton. The sample that has been taken for this article is of medium grade and is composed of four different counts of yarn, which are as follows: 2-40s warp for face and ends and 2-20s for the back; 2-30s is used for the binder and 2-16s for the filling yarns. The 2-40s and 2-30s yarns would be constructed from the same staple and stock, or American cotton of 1 5-16-inch staple and the 2-20s and 2-16s would be made from peeler cotton of 1⅛-inch staple. The picking particulars that have been given in previous articles may be used for these counts and staple cottons may be used, the following exceptions being noted. The total weight of the lap at the different processes for the 1 5-16-inch stock is as follows: breaker picker, 40 pounds or a 16-ounce lap; intermediate picker, 38 pounds or a 12-ounce lap and at the finisher picker 35 pounds or a 12½-ounce lap. For the 1⅛-inch stock the weights would be as follows: 40 pounds or a 16-ounce lap at the breaker, 39 pounds or a 12½-ounce lap at the intermediate and 39 pounds or a 14½-ounce lap at the finisher picker. The beater speeds used would be the same for both cottons, i. e., 1,500 revolutions per minute at breaker and intermediate and 1,450 revolutions per minute at the finisher, which gives the cotton passing through the finisher picker about 42 beats or blows per inch. At the card the draft of the 1 5-16-inch stock should be not less than 100 and the speed of the licker-in 350 revolutions per minute, while the flats, 110, make one complete revolution every 50 minutes. The

WEIGHT OF THE SLIVER

should be about 60 grains per yard and the production 750 pounds per week of 60 hours. The draft for the 1⅛-inch stock should not exceed 95 and the speed of the licker-in is about 375 revolutions per minute, while the flats make a revolution every 55 minutes. The weight of the sliver should be 65 grains per yard and the production 850 to 900 pounds per week. For all other particulars, see previous articles. The main point of difference in the setting points would be at the licker-in and feed plate, which should be set to accommodate each staple. The slivers are next put through three processes of drawings, the doublings at each process being 6 into 1.

The weight of the sliver at the finisher drawing should be 70 grains per yard for both staples and the speed of the front roll 350 revolutions per minute. Either metallic or leather covered top rolls may be used, but should favor the metallic rolls for these stocks. The drawings should be sized four times a day, and kept within two grains either side of standard weight. Watch your stop-motions and also the drawing as it is being delivered to see that no cut work is made, for this causes a lot of trouble in subsequent processes. All drawing as it is delivered in full cans at the finisher drawing should be marked with chalk so that it may always be distinguished from other staples, kinds and weights. These slivers are then put through the slubber and made into .50 hank roving, after which they are made into the following hank roving at the different processes named: For the 2-40s yarn, first intermediate, 2 hank, and second, 8 hank; for 2-30s yarn, first intermediate, 2 hank, and second, 6 hank; for 2-20s yarn, first intermediate, 1.25 hank, and second, 4 hank; for 2-16s yarn, first intermediate, 1,and 3 at the second intermediate. These rovings should be sized once a day, six bobbins being sized from each different hank.

WATCH YOUR TWIST

to see that you are putting in neither too much nor too little, and also your tension to see that you are not putting too great a strain on the yarn and thus making strained or unevenly drawn roving. The layers per inch are also another important point and for the hank rovings given above a good number is as follows: For the 3 hank, 20 layers per inch; for 4 hank, 25 layers; 6 hank, 33 layers, and for 8 hanks, 38 layers. The top leather rolls should always be kept in good condition and if not should be sent to be recovered. In putting in new rolls always put two new rolls on the same arbor and not, as is sometimes done, one old roll and one new roll. Keep

ROLLS WELL OILED

and also the spindle stops, which should be oiled at least once a month. The roving is next spun on spinning frames into 40s, 30s, 20s, and 16s, respectively. The particulars for these frames, with the exception of the 16s, have been previously given. For spin-

ning 16s filling use a frame having a 2¾-inch gauge, 1½-inch diameter ring and a 6½-inch traverse with a spindle speed of 7,000 revolutions per minute of the spindles. The yarn is then put through several special processes different from the machinery used for regular cloth warp and filling, when it is ready for the suspender loom.

Dyeing Particulars.

SKY BLUE.

One per cent diamine sky blue F F; 2 per cent sal soda; 20 per cent Glauber's.

PINK.

One-half per cent erika pink G; 1 per cent sal soda; 10 per cent Glauber's.

LIGHT GREEN.

One-half per cent diamine fast yellow B; ½ per cent diamine green G; 1 per cent sal soda; 10 per cent Glauber's.

YELLOW.

One per cent chrysophenine; 2 per cent sal soda; 20 per cent Glauber's.

RED.

Two per cent diamine fast red F; 1 per cent sal soda; 20 per cent Glauber's.

SCARLET.

Three per cent benzo fast red 4 B; 2 per cent sal soda; 20 per cent Glauber's salt.

SLATE.

One per cent diamine black B H; ¼ per cent diamine fast yellow A; 1 per cent sal soda; 20 per cent Glauber's salt.

BROWN.

Two per cent diamine brown B; ½ per cent diamine fast yellow A; 2 per cent sal soda; 20 per cent Glauber's salt.

NAVY BLUE.

Three per cent diamine dark blue B; 1 per cent sal soda; 20 per cent Glauber's.

BLACK.

Five per cent oxydiamine black N A; 2 per cent sal soda; 20 per cent Glauber's; aftertreat with formaldehyde.

BRONZE.

Three per cent diamine bronze G; 2 per cent sal soda; 20 per cent Glauber's.

ECRU.

Two ounces diamine catechine G; ½ pound sal soda; 10 per cent Glauber's.

INDIAN DIMITY.

Under the head of dimity are a variety of cotton fabrics characterized by stripes and cords, in both warp and filling way of the fabric, but more commonly the stripes and cords are in the warp only.

Dimity originally was understood to mean a stout cotton fabric with raised stripes, cords, crimps or ridges in the warp way of the fabric. These fabrics were further ornamented by being printed in various colors lengthwise of the fabric, in small patterns. This fabric was principally used for furniture covering and for like purposes.

Under the head of Indian dimity is a class of fabrics somewhat similar to the dimity described above, but made with finer yarn and used principally as a dress fabric.

The stripes and cords, however, constitute

THE CHARACTERISTIC FEATURE

of the fabric; the fabric without these stripes and cords would in all respects resemble a fair quality of lawn, batiste or muslin.

The cords in an Indian dimity appear in the fabric at regular intervals across the entire width. These cords may be effected by working two or more ends on the same harness or by using a coarser thread than the body of the warp. The cord usually interlaces with the filling in the same manner as the ground; that is, on the plain weave order. In addition to these cords, the fabric, after it is woven, is printed in stripes in the direction of the warp, with high colors. The patterns of these stripes are usually conventionalized floral figures. These floral stripes may alternate with an appropriate geometrical figured stripe. In the latter stripe the colors are usually more subdued, thus producing contrast and variety, a very desirable feature in a dress fabric, especially so in the cheaper grades of printed dress fabrics.

Varying the quality of cotton fabrics is such a general practice and is carried to such an extent that some fabrics lose their individuality; a fabric such as an Indian dimity, that has features in addition to its construction, has considerable scope for variation, consequently we find various grades and styles of Indian dimity—some in which the cords are much farther apart than in others, or sufficiently spaced to allow the stripe to be

printed between the raised cords, and others in which the cords are very close together, with but two or three ends between each cord. (See weave Fig. 1.) In printed fabrics of this character, where the printed patterns are in the form of a stripe, the cords should not be too prominent, or, if they must be prominent, the printed stripe should be of such a design that the outline is of an indefinite character, so that if any inaccuracy occurs in the printing, that is, if the cloth does not run perfectly straight through the printing machine, and the printed stripe interlaces too much with the cord, it appears as if the printed stripe was promiscuously placed on the fabric. The happiest patterns are those in which the ends are not very prominent and the stripe is printed over them at apparently regular intervals. Fig. 2 represents the drawing-in draft; Fig. 3 the reeding plan.

ANALYSIS OF FABRIC.

Width of warp in reed, 30½ inches;

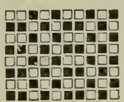


Fig. 1.

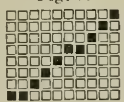


Fig. 2.

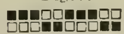


Fig. 3.

width of fabric finished, 29 inches; ends per inch finished, 94; 1,300x2 reed; ends in warp, 2,724.

Dressing: 1-2 E. white in 1 hed.
1 E. white.
1 E. white.
1 E. white.
—
4-5

Take-up of warp during weaving, 8 per cent; warp yarn, 1-80; filling yarn, 1-100. Picks per inch, 76.

LOOM REQUIRED.

Light-weight cotton fabrics, such as an Indian dimity, may be woven on any light built single box loom. The principal consideration should be given to the speed of the loom, as fabrics of this class require large production in order to amply compensate the manufacturers for making them. High-speed Crompton gingham looms would answer for weaving this class of goods.

FINISHING.

The fabric, after it is woven, is bleached, then slightly stiffened by immersing in a light solution of size. The size may be composed of the following ingredients: flour, wax and gelatine. After the sizing the fabric is dried, then slightly sprinkled with water, then run through a rotary press, after which follows the printing process. The fabric is then again slightly pressed in order to take out the creases which it contracted during the printing; then it is made up into laps or rolls.

Carding and Spinning Particulars.

The yarns that make up Indian dimity are made in mills of the third division, as given in a previous article. The fabric is generally made from Sea Island cotton of from 1⅝-inch to 1¾-inch staple. The sample under description is composed of 1-100s filling yarn and 1-80s warp yarn and for this article we will consider both yarns to be made from 1⅝-inch staple, Florida Sea Island cotton. Particular care should be paid to the mixing of this cotton and all bales not up to grade and staple should not be used. At the mixing bin the good sliver from the machines up to the slubber should be mixed with the raw stock. Too much waste should not be mixed on account of making the lap fleece. As this cotton is of a long staple it is very easy to put neps into it, and thus too great a speed of the beater of the picker should not be allowed. The beater should be run just fast enough to take out the dirt. This speed varies, on different stocks of the same length of staple, from 800 to 1,350 revolutions per minute. A good average speed of a two-bladed rigid type of beater for the breaker is 1,200 revolutions per minute, and for the finisher, 1,025 revolutions per minute. This latter speed gives the cotton passing through it about 29 beats or blows per inch. Sea Island cotton is generally put through only two processes of pickers and sometimes does not even pass through an opener, although this is an exception rather than a rule. At the breaker picker the lap at the front end weighs 30 pounds or a 12-ounce lap. These are put up and doubled 4 into 1 at the finisher picker, and the total weight of lap at this machine is 29½ pounds, or a 10-ounce lap. A variation of one-half pound either side of standard weight is allowed. These laps are put up at the card. The

DRAFT OF THIS MACHINE

for this stock varies according to the idea of the one in charge, but should not be less than 125. The top flats should be clothed with No. 36s wire

and should make one complete revolution every 35 minutes. The speed of the licker-in should be less than that used for shorter and coarser cottons and should not exceed 300 revolutions per minute, as it is claimed that this speed is high enough to tear it apart and clean it thoroughly and still not put neps into it. The doffer should be of as large a diameter as possible and should be clothed with No. 36s wire fillet. The cylinder fillet should be No. 34s. The weight of the sliver should be about 37 grains and the production, per week of 60 hours, 350 pounds. Clean, strip, and grind cards, as has been already stated in previous articles. The sliver is then taken to the sliver lap machine and for an 8¾-inch lap is doubled 14 into 1. The weight of the sliver at the front of this machine is 230 grains per yard of lap.

Watch your stop-motions on this machine. The laps are put up at the ribbon lap machine and doubled 6 into 1, although some mills make a heavier lap at the sliver lap machine, and only double 5 into 1 at the ribbon lap machine. The weight per yard of lap at the front of this machine is 210 grains. The rolls of the sliver lap machine for this stock are set as follows: Front to middle, 1¾ inches; middle to back, 2 inches and for the ribbon lap, front to second, 1¾ inches; second to third, 1⅞ inches; third to back, 2 inches. The laps are put up at the comber and doubled either 6 or 8 into 1, according to the number of heads that the comber contains, which we will consider to be 6. The sliver from this machine weighs 35 grains per yard; 25 per cent waste is taken out and the speed of the machine is 90 nips per minute. Use setting and timing previously given for this grade of stock. The cotton is next put through two processes of

DRAWING FRAMES,

the speed of the front roll being 350 revolutions per minute, and the weight of the sliver at the finisher drawing being 60 grains per yard. It is an important point to prevent all singles and doubles at this machine and to help make perfect drawing all stop-motions should be in perfect condition. Another important part to watch is the setting of the rolls. For this stock a good rule is as follows: Front to second, 1¾ inches; second to third, 1⅞ inches; third to back, 2 inches. These settings may be used at both drawings, although if settings are closed up 1-16 of an inch between each roll at the finisher drawing it will not injure the staple.

The top leather rolls of the sliver lap, ribbon lap, comber, and drawing frames should be kept in perfect condition and always well varnished. A stock of new and newly varnished rolls should always be kept on hand and the rolls on the machine examined frequently to see that they are perfect. Good recipes for varnish have been previously given. A part of the machines which it is not a general custom to give much notice to is the clearers. Now this is an important part and they should be looked after carefully to see that they are doing their duty properly. This refers to both top and bottom clearers on all machines on which they are used.

At the slubber the drawing is made into .80 hank roving. At this machine watch the top rolls, the build of the bobbin, the lay, twist, tension and traverse motion. For this stock the front rolls are generally varnished and if it is in a mill made to run this length of stock the top and bottom front rolls are of a larger diameter so that the stock will not lick up so easily. The roller settings for the slubber are as follows: front to middle, 1 11-16 inches; middle to back, 1⅞ inches.

THE SLUBBER ROVING

is then put through three more processes of fly frames, the hank roving made at each process being as follows: First intermediate, 2.25; second, 5, and fine, 18 hank for warp yarn and 20 hank for filling yarn. The warp yarn is ring spun on a frame having a 1⅜-inch diameter ring, 5¼-inch traverse, 39.08 twist per inch and a spindle speed of 9,600 revolutions per minute. The yarn is then spooled and warped and then run through a slasher, after which it is drawn in and is then ready to weave. A good slasher size for this yarn is as follows: Water, 100 gallons; potato starch, 70 pounds; tallow, 7 pounds; Yorkshire gum, 3 pounds; white soap, 2 pounds. Boil two hours and let stand 10 hours before using. Keep agitator running and keep size almost at a boiling point when sizing. The yarn for filling is generally mule spun, after which it is conditioned and then is ready for weaving.

Colors for Printing.

PALE VIOLET.

Prepare ten gallons of printing paste with one pound chrome violet M for printing; 60 pounds gum solution 1:1; two pounds glycerine; 33½ pounds

water. Heat to about 160 degrees F., allow to cool, then add 2½ pounds formic acid 90 per cent; 1 pound acetate chrome, 32 degrees Tw.

DEEP VIOLET.

For 10 gallons paste, 10 pounds chrome violet M for printing; 50 pounds starch tragacanth 65:1,000; 34 pounds water. Heat to about 160 degrees F., allow to cool; add 2½ pounds formic acid, 90 per cent, 3½ pounds acetate of chrome, 32 degrees Tw.

BLUE.

For 10 gallons paste, 14½ pounds chrome fast blue F R for printing; 3½ pounds chrome violet M for printing; 45 pounds starch tragacanth thickening; 12 pounds water; heat to about 160 degrees F.; allow to cool then add three pounds hyraldite A, dissolved in 3½ pounds water; one pound formaldehyde, 40 per cent; 2½ pounds formic acid; 15 pounds acetate of chrome; Steam through Mather & Platt. The pieces are then left exposed to the air for several hours, passed through a weak chrome bath, washed, soaped, rinsed and dried.

SKY BLUE.

Two and one-half ounces alizarine blue S P; 2½ pints gum thickening; 1 quart water; ½ pint acetate chrome 32 degrees Tw. Print and steam and soap.

PEA GREEN.

Two pints alizarine green D G paste; 1½ gallons tragacanth thickening; 1 gill acetate of chrome 32 degrees Tw.; 2 quarts water. Print, steam and soap.

PINK.

Four ounces rhodamine 6G; ½ pint water; 1½ quart tragacanth thickening; ¼ pint acetic acid, 9 degrees Tw.; ¼ pint acetate chrome, 32 degrees Tw. Print, steam and soap.

RED.

One pound brilliant Rhoduline red B D; 1 gill glycerine; 2 pints water; 1½ pounds acetic acid, 9 degrees Tw.; 1 gallon gum water, 1:1; 2 pints acetic acid tannic acid solution, 1:1. Print, steam one hour, soap.

PURPLE.

Five ounces methyl violet 2 R; 2½ quarts water; 3 pints acetic acid, 9 degrees Tw.; 1¼ gallons gum water 1:1; 1½ pints acetic acid, tannic acid solution 1:1. Print, steam one hour, soap.

GRENADINE.

Grenadine is a fine gauzy dress fabric made with various combinations of materials, such as silk and cotton, silk and wool, or cotton and wool, and some of the cheaper grades are made with all cotton yarns.

The fabric is plain and loosely woven and invariably ornamented by stripes, sometimes in both warp and filling, but usually in the warp only. These stripes may be of an ordinary satin or uneven sided twill weave. In the better grades of grenadine the ornamentation is more intricate, that is, the figuring is of such a character that it requires a special loom, such as a lappet or swivel loom. If the figuring is to be effected by means of an extra filling, the swivel loom is used. With the use of this loom the figuring is in the form of spots or set figures over the entire fabric.

The grenadine of which the analysis will follow is a cotton warp and silk filling fabric, ornamented with a zigzag warp stripe, effected by the lappet attachment to the loom.

This method of forming stripes on a fabric was in use prior to the introduction of the swivel loom. The method of operation in this class of weaving consists of passing an independent set of threads through a series of needles set in a frame. This frame is situated between the reed and shuttle race way of the lay.

This frame is arranged so as to slide horizontally to and fro. This sliding is regulated by the pattern chain, and the needles are lowered at the proper time, so as to allow the figuring threads to interlace with the ground cloth, by passing the filling over the figuring threads, thereby binding the figuring threads into the ground structure of the fabric. The movements of the needles may be timed so as to interweave with the ground cloth at each throw of the shuttle or otherwise, as may be desired. The figuring threads, however, must be on a separate warp beam on account of the difference of take-up during weaving.

Diagram, Fig. 1, illustrates the method of interlacing the figuring threads into the ground structure of the fabric.

This fabric, as mentioned above, is of an openwork texture. The construction, that is, the ends and picks per

inch in the ground structure of the fabric. should be of such a number as to make the fabric firm enough to fulfill its purposes. As the fabric is used entirely for dress goods, it is subjected to considerable wear. In order to retain its characteristic feature, that is, transparency or openness of texture, the ends and picks per inch should be of such a number that in the finished fabric the meshes will be no larger than the diameter of the yarn used in the fabric; otherwise the fabric will not wear satisfactorily.

From the above it will be observed that in order to produce a fabric that is satisfactory in all its aspects, viz., appearance, feel or handle and wearing qualities, absolute accuracy is required in calculating for the construction of such a fabric. Grenadine may be woven in the gray, then dyed any color desired, or the warp may be dyed in the hank and the filling dyed after it is woven into the fabric. In the better grades these fabrics are usually woven with dyed yarns. The prevailing color for grenadines is solid black.

ANALYSIS.

Width of warp in reed, 30 inches; width of fabric finished, 27.5 inches; ends per inch in reed, 34; ends per inch finished, 92. Reed, 42x2; take-up of ground warp during weaving, 5 per cent; take-up of figuring warp during weaving, 12 times the length of fabric woven; ground warp, 1-60s cotton; figuring warp, 2-40s mercerized cotton.

In the drawing-in, the ground warp only is drawn through the heddles in the harness; the figuring warp passes over the harness into the eyes of the needles, the needles being in front of the reed. The figuring warp is not drawn through the reed, but is guided entirely by the needles.

Filling: 1¼ dram silk, picks, 90 per inch finished.

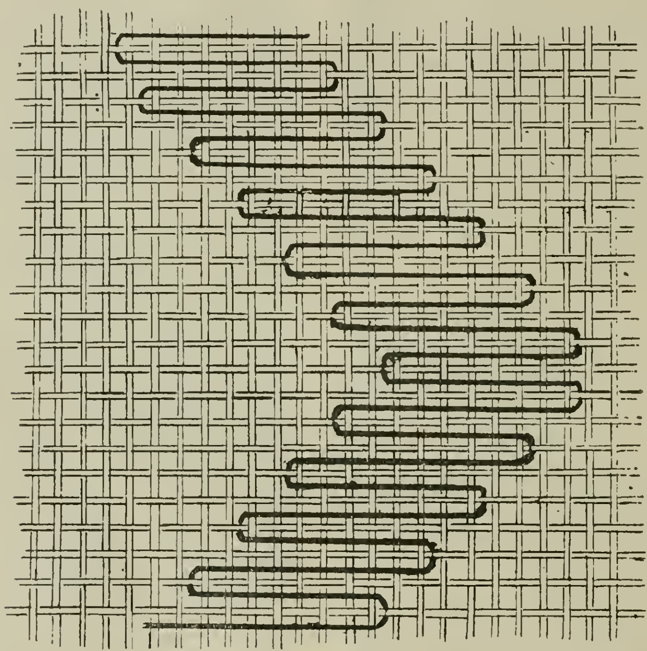


Fig. 1.

Fig. 2 shows ground and figure weave.

Fig. 3 ground warp drawing-in draft.

LOOMS USED.

These fabrics are woven on various looms, various makes of dobby looms, lappet, swivel or jacquard, depending entirely on the character of figure to be woven. The jacquard loom is used when the fabric is to be ornamented by large broken plaids, requiring too many ends to be conveniently handled on a dobby loom.

FINISHING.

The finer grade of grenadine requires

very little attention as regards finishing. After the fabric comes from the loom it is examined for broken threads or picks. The finishing is practically in the weaving. If the fabric is perfect when it comes from the loom, it is run through the rotary press, subjected to a little steaming and slight pressure, and then made up into laps ready for the consumer.

Carding and Spinning Particulars.

The counts of yarn used for the warp in the sample described above for grenadine are 1-60s ground warp and 2-40s for figuring warp. The staple cotton used for the ground warp would be about 1⅜ inch for Allen or peeler cotton, while that used for the figuring warp, which is mercerized, would be made from a Sea Island cotton, which is especially adapted for mercerizing purposes, of 1⅝-inch staple. The 1⅜-inch peeler cotton would be put through an opener and three processes of pickers, the speed of a two-bladed beater being as follows: Breaker, 1,500 revolutions per minute; intermediate, 1,400 revolutions per minute, and finisher, 1,400 revolutions per minute. The

WEIGHTS OF THE LAP

for this fabric would be, at the breaker, 40 pounds or a 16-ounce lap, intermediate, 38 pounds or a 12-ounce lap, and at the finisher, a 38-pound or a 13-ounce lap. For the Sea Island stock there would be an opener and two processes of pickers, the speed of a rigid two-bladed beater being as follows: 1,300 revolutions per minute at breaker and 1,200 revolutions per minute at finisher; the weight of the lap would be 34 pounds or a 10-ounce lap at breaker, and at the finisher a 30-pound lap or a 10½-ounce lap. For general instructions for mixing and picking, use those that have been previously given. At the card the particulars used for the peeler cotton are: A draft of not less than 110, with a licker-in speed of 300 revolutions per minute, flats (110) making one complete revolution every 35 minutes. The speed of the cylinder is 160 revo-

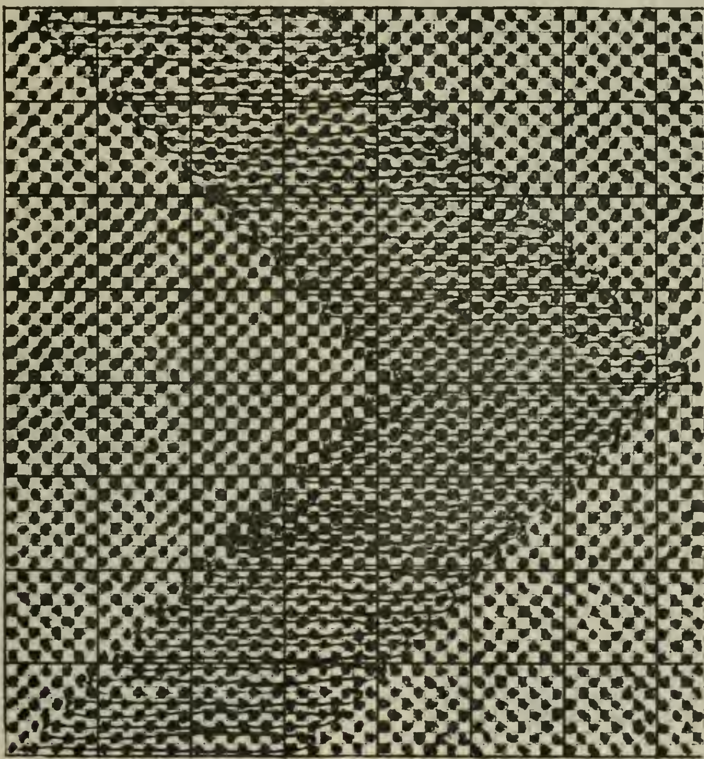


Fig. 2.

lutions per minute The production should be 500 pounds with a 45-grain sliver for 60 hours per week.

FOR SEA ISLAND STOCK

the draft should not be less than 130. The speed of the licker-in is 275 revolutions per minute, flat 1 revolution in 35 minutes, the weight of sliver 40 grains per yard and the production 350 pounds per week. The wire fillet used for both stocks should be 34s for cylinder and 36s for top flats and doffer. Use comber sliver is next put through two processes of drawing frames, the doublings being 8 into 1 at the breaker for peeler and 6 into 1 for Sea Island, while at the breaker the doubling is 6 into 1 for both stocks. If metallic rolls are used they should be spread ⅛ of an inch farther apart than when leather top rolls are used. Watch the stop-motions. The weight of the drawing sliver at the finisher drawing is 75 grains per yard for the peeler and 60 grains for the Sea Island stock.

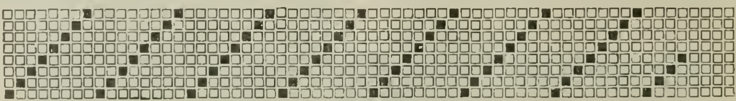


Fig. 3.

as large a doffer as possible. The setting points have been given previously for these stocks. Strip three times a day and grind each card at least a day every month. Both the Sea Island and the peeler cottons for this class of goods are combed and for this article we will suppose that an 8¾-inch lap is use. For

THE PEELER STOCK

the ends are doubled 14 into 1 at the sliver lap machine or, as it is sometimes called, the small doubler, the weight per yard of the lap being 300 grains, and at the ribbon lap or large doubler these laps are doubled 6 into 1, the weight of the lap being 280 grains per yard. These laps are put up at the comber and doubled 6 into 1. The percentage of waste taken out is 16 and the weight of the sliver is 45 grains per yard. Use settings and timings previously given. For the Sea Island stock the weight at the sliver lap is 220 grains per yard and these laps are doubled 6 into 1 at the ribbon lap machine, the weight of the lap being 215 grains per yard. At the comber the doublings are 6 into 1 and the weight of sliver is 35 grains per yard; 20 per cent of waste is taken out and the settings and timings used are the same as those given in the article on Indian dimity.

VARNISH.

Do not use the same varnish for the sliver lap, ribbon lap and draw box rolls and the leather detaching rolls of the comber. For the latter use a varnish that has less glue and a dead finish, while for the former rolls use a roll with a smooth, glossy finish, but use a varnish that does not peal or crack easily. Always keep rolls well varnished and in good condition. The

AT THE SLUBBER

the sliver for 60s yarn is made up into .50 hank roving, after which it passes through three processes of fly frames or speeders, being made into the following hank roving at each process: 1st intermediate, 1 hank; 2d intermediate, 3 hank and fine frame, 12 hank. The Sea Island stock is made into .70 hank at the slubber and passes

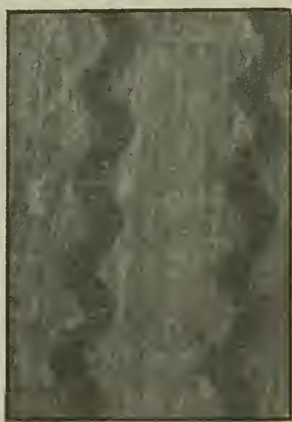


Fig. 4.

through two processes of fly frames, where it is made into 2.25 hank roving at 1st intermediate and 8 hank at finisher frame. Use all the precautions given in previous lessons as to rolls, etc., and remember that the Sea Island stock

REQUIRES LESS TWIST

per inch than the peeler. The peeler cotton is made into 60s hank on a warp spinning frame, the particulars of which have been given in a previous article, while the Sea Island is

made in 40s yarn on a warp frame having a 1½-inch diameter ring with a 6-inch traverse and a spindle speed of 10,000 revolutions per minute; this is then twisted and put through the mercerizing process, after which it is ready for use.

A good slasher sizing for 60s yarn for light-weight cloth is as follows: Water, 100 gallons; potato starch, 54 pounds; Yorkshire gum, 2 pounds, and white soap, 1½ pounds.

Dyeing Particulars.

Dyed in jig machine.

BLACK.

8 per cent thion black T G C; 8 per cent sulphide sodium; 3 per cent soda ash; 20 per cent salt.

BLUE.

6 per cent thion blue B; 10 per cent sulphide sodium; 3 per cent soda ash; 20 per cent salt.

Dye and rinse well. Aftertreat with 2 per cent peroxide sodium; 8 per cent sulphate magnesia; 8 per cent acetic acid, 8 degrees Be. Dissolve the sulphate of magnesia first, then put in the peroxide of sodium in small quantities, and enter the goods; work for 20 minutes first; then run the acetic acid into the bath, and gradually increase the heat to about 180 degrees F.

BROWN.

4 per cent thion brown R; 4 per cent thion brown O; 2 per cent thion orange N; 12 per cent sulphide sodium; 3 per cent soda ash; 30 per cent salt.

BRILLIANTE.

Brilliante is a cotton fabric of light or medium weight, distinguished by small, detached figures, usually of geometrical or simple character, arranged on a plain ground. The figures are formed with the filling, which is soft twisted.

The object sought is to cover the warp with the filling as much as possible, both in the ground and figure. It is obtained by using warp yarns considerably finer than those used for the filling in the same piece, aided by the slack twist in the filling.

The goods are used principally for shirtwaists and dress goods.

Fig. 1 illustrates a typical brilliante fabric, the analysis of which shows the following data: 88 sley, 66 picks, 50s warp, 30s filling; finished width, 26¾ inches. The pattern is complete on 100 ends and 84 picks. The figures are arranged in irregular positions, 8 in a repeat.

One of the figures is illustrated in Fig. 2; marks represent filling.

Like many other cotton fabrics, goods under this name are made in various

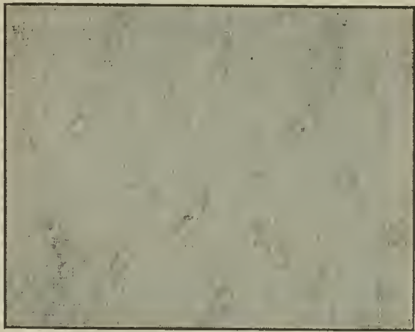


Fig. 1.

grades, variations in the counts of yarns necessitating corresponding variations in the counts of cloth. A fabric under consideration, shown in Fig. 3, has a filling so coarse, as compared with the warp, that it has the appearance of a poplin ground. This is a dobby pattern, the spots being arranged in a 4-end sateen or broken crow order. Each spot is made by the filling covering nine ends on two picks, as in Fig. 4. The float of the

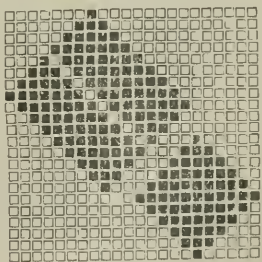


Fig. 2.

second pick of each alternate spot is moved over two ends.

LOOM REQUIRED.

Most brilliante patterns necessitate the use of a jacquard head. A machine of 300 or 400 hooks gives ample scope for designs. The goods being of firm structure, with all the ends taking up

practically evenly, they could be woven most economically on a light running single box loom fitted with a double lift, single cylinder jacquard. One warp and one filling only are required.

There being but little scope for developing other than small designs of this type, on dobby looms, they are made to but little extent on these looms. Experience has taught that

Fig. 3.

patterns like Fig. 3 require too many harnesses on a dobby loom for weaving plain to the best advantage.

FINISHING.

These goods are usually subjected to the English or French nainsook finishes, mercerized or printed. By the English finish the fabric, after it leaves the loom, is boiled off, then bleached, after which it is softened by immersing in a light solution of glycerine, or cocoanut oil, and flour or farina, after which it is dried by passing over heated cylinders, then run through a rotary press with very light pressure. In the French finish, after the fabric is bleached it is stiffened by immersing in a solution of size, composed of the following ingredients: flour, wax and gelatine, after which the fabric is dried, then slightly sprinkled with water, then run through the calender, which completes the finishing process.

The fabric illustrated in Fig. 1 has undergone the mercerizing process of finishing, having been mercerized in the piece. Brilliante is a type of goods in which the essential qualities of the pattern are improved by the mercerizing process.

When they are printed, the printed patterns are secondary to the weave effects and usually consist of small detached sprig or floral effects arranged a great distance apart.

Carding and Spinning Particulars.

The yarns of which brilliante is composed are made in mills of the second and third divisions as given in a previous lesson. The yarns used in the sample under consideration are 50s for warp and 30s for filling. Both of these yarns are combed and made from the same grade and staple of cotton. The filling is coarser and according to established rules should be made of a shorter length of staple, and this would be true if it were not for the fact that in order to produce certain effects in the cloth this yarn is required to have a softer twist than that generally employed for this count of yarn. The cotton used may be a peeler of 1⅜-inch staple.

THE MIXING

would be done as described in previous articles, the good sliver waste from the machines up to the slubber being thrown into the mixing bin. If the equipment of machinery does not include a roving waste machine, a good way to mix the roving waste is as follows: Run the roving waste through a picker, allowing it to run on the floor at the front, and not formed into a lap as is generally done; this is then gathered up and scattered over the mixing. This is a very good method, but is not generally used on account of the pickers having all they can do to keep up with the cards. This class of work is put through an opener and three processes of pickers. The pickers, if supplied with a rigid type of beater having two blades, have the following

SPEEDS

at each process: Breaker picker, 1,500 revolutions per minute; the fan speed 1,400 revolutions per minute; intermediate picker, 1,450 revolutions per minute; fan speed, 1,050 revolutions per

Fig. 4.

minute; finisher picker, 1,450 revolutions per minute; fan speed, 1,100 revolutions per minute. The weights of the lap at the different processes are as follows, the doubling at each process after the breaker picker being 4 into 1: breaker picker, total weight, 40 pounds; weight per yard, 16 ounces; intermediate picker, 39 pounds or a 12-ounce lap, and finisher picker, 36 pounds or a 12½-ounce lap. Of course the laps should be kept of as even a weight as possible, a variation of only 8 ounces either side of the standard weight being allowed at the finisher picker. These laps are put up

AT THE CARD

and for this fabric the draft should

not be less than 110. The licker-in speed should be 300 revolutions per minute. Flats should make one complete revolution every 38 or 40 minutes. The weight per yard of the sliver at front is 50 grains per yard and production for a week of 60 hours is 550 pounds. Set doffer to cylinder to a 5-1,000th-inch gauge; licker-in to cylinder to a 7-1,000th-inch gauge. Set cylinder screen at licker-in to 12 gauge, at centre to a 34 gauge, and at front, ¼ inch.

Set back plate to cylinder at 10 gauge at bottom and at 22 at top; licker-in screen to licker-in, 3-16ths inch from licker-in. Set licker-in knives, top knife at 12 gauge, bottom knife at 5 gauge; if only one knife, set at 5 gauge. Set feed plate to cylinder according to length of staple. This is

AN IMPORTANT POINT

many times overlooked by men in charge. The general rule is to set at this point the same for all lengths of staple. This is wrong, because in short-staple cotton the feed plate should be set closer than for long stock. For example, suppose the feed plate is set to licker-in at 7 gauge for 1⅛-inch stock and we will say that this gives the distance from bite of feed roll to licker-in 1¼ inches. Now we change to 1¾-inch Sea Island stock. If we do not reset the feed plate we are almost sure to break the fibre, and if the cotton is stapled at the front of card and compared with the staple at the back, it will be seen that this is what is being done. Of course the proper remedy for this is to get a feed plate with the proper shaped nose for each length of staple, but it is not always possible to do so; the

NEXT BEST REMEDY

is to set the feed plate farther back or to slow down the speed of your licker-in, so that the fibres will not be struck away from the feed roll so quickly. If the setting at this point is the same for all staples and gives a variation of ½-inch length in staple at front and back, note result. If the staple breaks, it is weakened so much. Set top flats to 12 gauge at back and to 10 gauge at other setting points. Set front stripping plate to 22 gauge at bottom and at top set from a 7 to a 12 gauge, according to the strip wanted.

At the sliver lap machine the doublings are 14 into 1 for an 8¾-inch lap, the weight of a yard of lap being 295 grains. These are doubled 6 into 1 at ribbon lap, the weight being 275 grains per yard. At the comber these laps are doubled either six or eight into one according to the number of heads. For a 6-head comber the sliver at coiler should weigh 45 grains per yard; speed of comber, 90 nips per minute; percentage of waste, 15; and draft about 27.50. Use same setting and timing as given in previous articles. At

THE DRAWING FRAME

two processes are used, the doublings being 6 into 1 at each process. The speed of front roll at each process should be 400 revolutions per minute, and the weight of the sliver at the finisher drawing should be 70 grains per yard. At the slubber this is made into .60 hank roving and is put through two processes of fly frames, the hank roving at each process for the 50s warp being 2.50 at first intermediate, and 10 hank at second process. For the 30s the hank roving at the first intermediate is 2 and at the second process 6 hank. Look out for the points that have been explained in previous articles. At the spinning room the roving for warp yarn is spun into 50s under the following conditions: diameter of ring, 1½ inches; length of traverse, 6 inches; twist per inch, 31.80; spindle speed, 10,000 revolutions per minute. The filling yarn is mule spun, with 2.75 times the square root of count for standard twist.

Dyeing Particulars.

NAVY BLUE.

Four per cent naphtamine blue 2 B; 25 per cent Glauber's; 3 per cent sal soda.

PINK.

One-half per cent Erika pink G; 20 per cent Glauber's; 1 per cent sal soda.

SKY BLUE.

One-half per cent diamine sky blue F F; 10 per cent Glauber's; 1 per cent sal soda.

PEA GREEN.

One per cent diamine sky blue; ½ per cent chrysophenine; 20 per cent Glauber's; 1 per cent sal soda.

ECRU.

One-half ounce naphtamine brown N; 1½ ounces naphtamine yellow N N; 10 pounds salt; 1 per cent sal soda.

YELLOW.

One per cent direct yellow G conc.; 20 per cent salt; 1 per cent sal soda.

RED.

Three and one-half per cent direct

scarlet B conc.; 25 per cent salt; 2 per cent sal soda.

BROWN.

Four per cent naphtamine brown R G; 30 per cent salt; 2 per cent sal soda.

GREEN.

Four per cent diamine green G; ½ per cent diamine fast yellow B; 25 per cent salt; 3 per cent sal soda.

BOOK MUSLIN.

Book muslin is a textile term that is somewhat of a misnomer, not having any connection with fabrics used for book coverings. The goods are used very extensively for stiffening and lining clothing and for the foundation work of ladies' hats; they are distinguished more by the feel or finish than by appearance. They vary in appearance from plain weave to small checks. Being made more for utility than effect, fancy weaves are not called for or

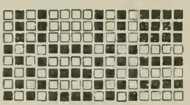


Fig. 1.

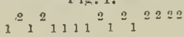


Fig. 2.

Fig. 3.

Fig. 4

necessary. One of the principal weaves used is a leno, one end crossing one.

An analysis of a book muslin sample shows the following data: Finished width, 32 inches; 24s yarn in both warp and filling, 54 ends and 45 picks per inch.

The weave is shown in Fig. 1, being on 16 ends and 8 picks. The general effect is shown by 8 ends and 8 picks, the next 8 ends differing only in the plain weave being reversed. Fig. 2 shows the harness draft and Fig. 3, the reed draft. The warp yarns average 8 ends in 5 dents, there being 16 ends in 10 dents per pattern. The 4 ends working as 1 are drawn through one heddle. The chain draft is shown at Fig. 4, the working of the first two, or selvedge, harnesses being plain.

Stop pegs are not required, the 3 picks in 1 shed coming into contact with each other.

Another book muslin fabric under consideration contains the same counts of yarns as the other sample. The count of this cloth is 43x38, and the width 35 inches finished. The weave is plain.

Book muslins are usually woven white and piece dyed in solid colors.

LOOM REQUIRED.

Any of the three classes of weaves mentioned may be woven on single box, fast, light running looms. The sample analyzed would require a dobby loom. The leno and plain weave samples could be woven best on cam looms. One beam only is required.

FINISHING.

Before finishing, the goods feel very sleazy. The effect obtained by finishing is to change this cloth into a very stiff, board-like fabric. Goods for linings are sized the least; those for stiffening and millinery purposes are sized heavily.

After being woven, the cloth is washed, dyed, dried, sized, dried and folded as desired. No burling, singeing or shearing is required, as perfect cloth is not absolutely essential and the glue or size, combined with the pressing, lays the loose fibres.

In sizing, the cloth passes through the size box and on to the drying cylinders. If a glazed finish is required, it is subjected to pressure by the heated rollers of the calender machine.

The sizing substances are usually glue, gum, flour and size, of variable proportions, mixed with water to the desired consistency. The weight of size in a piece will vary from about 5 per cent to 40 per cent of the entire weight.

Carding and Spinning Particulars.

The yarns that make up book muslin are made in mills of the first and second divisions. For this class of fabric a short-staple medium grade of cotton is used. The general staple is about one inch. In the better qualities of this fabric only the raw stock is used in the mixture, but the poorer qualities contain a certain percentage of waste, either comber or card being used according to the quality required. For this article we will consider that the mixture is made up without waste.

THE MIXING

for this class of cotton should be as large as possible because production is looked to more than quality, but the

quality should be as good as possible. The cotton is put through an opener and three processes of pickers. The speed of the beater of the opener should be 1,050 revolutions per minute, the fan on this machine making 350 revolutions per minute. This opener is generally directly connected to the breaker picker. This picker may be provided with either a pin, or, as it is sometimes called, a carding beater, or a rigid type having either two or three blades. If a two-bladed rigid beater, the speed should be 1,500 revolutions per minute; if a three-bladed beater, the speed should be reduced to 1,000 revolutions per minute. The fan speed should be 1,400 revolutions per minute. The draft of this picker should be about 1.85. The

WEIGHT OF THE LAP

at the front should be, total, 40 pounds; weight per yard, 16 ounces. These laps are put up and doubled 4 into 1 at the intermediate picker. The beater of this picker, if a two-bladed rigid type, makes 1,450 revolutions per minute with a fan speed of 1,050 revolutions per minute and a draft of 2.80. The total weight of lap at the front is 38 pounds or a 10-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. The speed of this beater, if two bladed, should be 1,450 revolutions per minute; fan speed, 1,100 revolutions per minute; draft, 2.80; weight of laps at front, 39 pounds or a 14½-ounce lap. The stock passing through this machine with these speeds receives about 41 blows or beats per inch. At the card the speed of the licker-in varies from 300 to 350 revolutions per minute, according to make of card. The speed of flats is 1 revolution every 45 minutes (110 flats).

THE CARDS

should be stripped at least three times a day and the doffer should be stripped an extra time if a very large production is being turned off. Use a coarse wire fillet for both doffer and cylinder for cards on this stock, and use settings given for indigo prints in a previous article. The draft of the card should not exceed 100 for this class of goods. The weight of the sliver should be 65 grains per yard and the production 850 pounds for a week of 60 hours. Grind cards as previously stated. The card sliver is next put through two processes of drawing, the doublings being 6 into 1 at each process. The speed of the front roll is 400 revolutions per minute for leather top rolls and 375 for metallic top rolls. Metallic top rolls will be found to be

AN ADVANTAGE

on this class of stock, but should be looked after to see that they are properly set. Generally speaking, metallic rolls should be set 3-16ths of an inch farther apart than leather top covered rolls. If metallic rolls are used, care should be taken to see that they are the same distance apart their entire length, because if they have sprung, cut work will be the result. The flutes of these rolls should be kept clean and the bearings well oiled and clean or bad results will be obtained. The weight of the sliver at the front of both breaker and finisher drawings should be 72 grains per yard. Drawings should be sized four times a day. The drawing should be put up to the slubber and made into .50 hank roving and put through two processes of

FLY FRAMES.

At the first intermediate it is made into 2 hank roving and at the second 5 hank. Of course these hank rovings will depend a great deal on the way a room is balanced and the amount of production to be turned off. Sometimes two different stocks of the same length of staple will be run together at the slubber and first intermediate frames that are going to be made into two different counts of yarn. This is often done in rooms where there are not enough frames to have each frame run a different stock, so that it may be necessary to alter the draft and hank roving of one or both stocks to the best advantage of each. Thus it will be seen that the hanks and drafts given here may be used as a foundation from which to work, and used if each machine is using this one staple, and grade and kind of cotton. The roving is taken to the spinning frame and made into 24s yarn. At the warp frame use a 2-inch diameter ring, 7-inch traverse, 23.27 twist per inch and 9,400 revolutions per minute spindle speed. For a filling frame use 1½-inch diameter ring, 6½-inch traverse, 15.9 twist per inch and a spindle speed of 7,600 revolutions per minute. A heavy sizing is used for this class of goods.

Dyeing Particulars.

Dyed on the jig machine.

BLACK.

Five per cent oxydiamine black A T; 3 per cent sal soda; 20 per cent salt.

BROWN.

Five per cent diamine brown B; 1

per cent diamine fast yellow B; 2 per cent sal soda; 25 per cent salt.

SLATE.

One and one-half per cent diamine black B H; 2 ounces diamine fast yellow B; 2 per cent sal soda; 25 per cent salt; make up a starch liquor with 10 ounces dextrine; 1 gallon water; mix cold. Add a little color to match shade required, and boil well for one hour. Starch on mangle and dry on the tenter frame.

MULL.

Mull may be defined as a thin, plain woven fabric, of which there are several varieties, as Swiss, India, starched, China or silk. The China or silk mull is a union fabric, usually with cotton warp and silk filling. This is the finest fabric of the above-mentioned varieties and is used exclusively for dress goods.

The Swiss and India mulls are fine, soft-bleached cotton fabrics, principally used for dress goods.

THE STARCHED MULL

is somewhat coarser than the Swiss or India mull and is used principally for stiffening in various parts of a dress, usually dresses of unwashable material, and is also used as a foundation for ladies' silk trimmed hats, curtains, etc. Starched mull is a plain, loosely woven fabric and is stiffened in the finishing process by sizing.

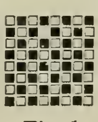


Fig. 1.
Design.

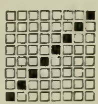


Fig. 2.
Draft.

These various qualities of mull differ in point of texture considerably from one another; the silk mull is in point of texture twice as fine as some grades of cotton mull.

The China or silk mull and also the cotton mull used for dress purposes are characterized by their

SOFTNESS.

This feature is partially brought about by the materials used and partially by the finish which the fabric receives. The silk mull requires less attention in finishing, as the materials used in the construction of the fabric, the silk filling in particular, and the high grade of the cotton warp, are in themselves conducive to producing a soft fabric.

In the cheaper grades of cotton mull, wherein the coarser counts of yarn are used, the warp yarn must first be well sized so as to withstand the tension and strain incurred during the process of weaving. This sizing, while it strengthens the warp yarn, imparts to the fabric a harsh handle or feel, due to the ingredients used in the size, which may be wheat, flour, farina or sago and a small quantity of softening materials, usually tallow or wax. The softening materials are necessary in order to make the yarn pliable; otherwise it would be inclined to be too brittle to weave readily. After the fabric is woven and ready for the finisher it is subjected to a

WASHING PROCESS,

which takes out all the sizing materials in the warp yarn, after which the fabric is subjected to a combination of sizing materials for the sole purpose of softening the fabric. The above process applies more particularly to the all-cotton fabrics.

This class of fabrics—mull—requires very little ingenuity on the part of the designer to produce, there being no ornamental features or fancy weaves. The goods are plain woven, depending for their beauty or attractiveness entirely on the finishing. Mull made for dress goods is of fine texture, and is finished very soft, while the fabric intended for lining or decorative purposes is much coarser in texture than the dress fabric, and is stiffened in the finishing and commonly known as starched mull.

The goods are usually

WOVEN IN THE GRAY

and the bulk of them are finished pure white or bleached, although these fabrics may be obtained in almost any color desired.

The China or silk mull is usually, like the all-cotton fabric, finished undyed. In the former case, however, the cotton yarn is bleached in the hank. The silk filling used in this fabric is raw silk, viz., tram silk. This is soft and very pliable and lends itself readily to the production of a soft fabric. The filaments of raw silk cannot be spun into a thread like wool and cotton, as they have no peculiarities of surface that correspond to the scales on the surface of the wool fibres; the wool fibres, when spun into a thread, are arranged so that these scales are opposed to one another as much as possible and thereby interlock and hold

36", 108x 110, 900.1100.

fast to one another, and the more the threads are spun, the closer they engage one another and in consequence produce a stronger thread. The peculiarities of the cotton fibre are its twists. The cotton fibre under the microscope appears as a thin flat tube or ribbon, considerably twisted; these twists in the fibres give strength to the thread by interlacing with one another somewhat on the order of the scales in the woolen threads. In silk, however, the filaments can only be made into a thread by twisting a number of the filaments into fine threads, and these threads are again twisted until a thread of the desired count is obtained. Following is an

ANALYSIS

of a cotton and silk fabric:

Width of warp in reed, 28½ inches; width of fabric finished, 27 inches; ends per inch in reed, 76; ends per inch finished, 80; ends in warp including selvedges, 2,200; reed, 1,400x2; warp yarn, 1-60s cotton.

Filling, one dram silk, tram; 54 picks.

ANALYSIS OF STARCHED MULL.

Width of warp in reed, 33¼ inches; width of fabric finished, 30 inches; ends per inch in reed, 36; ends per inch finished, 40; ends in warp including selvedge, 1,220; reed, 1,300x1; warp 1-50s cotton.

Filling, 1-54s cotton; 36 picks.

LOOM REQUIRED.

Any ordinary single box loom may be used for weaving this fabric. The speed of the loom is the most important consideration if the selection of loom be optional; the finer grades of mull are usually woven on eight harnesses, straight draft, while the coarser grades are confined to four harnesses, drawn in the following order: 1, 3, 2, 4.

FINISHING.

Mull made for dress goods is of a very fine texture and softened in the finishing. This is accomplished by immersing the fabric in a solution of oily matters, the ingredients being composed of a liberal percentage of glycerine or cocoanut oil and a very small quantity of farina. Chloride of magnesium may be used with good results. This is a very powerful softener, as well as a weighting material, and has a great affinity for water, and has the power of attracting moisture to the cloth in which it is used. This attraction of moisture really constitutes the softening effect. The above method of softening applies in particular to all-cotton mull. In the silk filling goods the fabric is usually only boiled off, then run through a rotary press.

For stiffening the fabric, the goods, after they are bleached, are immersed in a solution of size composed of flour, tallow, and gum arabic; this stiffening is done in front of the drying cylinders, the goods running through the sizing trough on to the cylinders, which completes the finishing.

Bleaching Particulars.

Boil with 4 degrees Tw. caustic soda in a kier for 12 hours, and run through washing machine.

Give a second boil with 4 degrees Tw. caustic soda.

Wash through machine and run through solution of chloride of lime at ½ degree Tw. Place in bin for two hours. Pass through a solution of sulphuric acid ½ degree Tw. Pass through washing machine till all trace of acid is eliminated.

Starching Particulars.

One gallon: 4 ounces dextrine, 4 ounces cornstarch. Boil for one hour and starch through mangle.

Dry on the tenter frame.

LINON.

Linon, usually termed India linon or India linen, is a fine, closely woven plain fabric well known for its excellent wearing and washing qualities. It is made from combed cotton yarns of long-stapled stock.

It is made in various widths, from 27 inches to 36 inches, and in slightly varying constructions and qualities. The goods are made to resemble as closely as possible fine linen fabrics. The cloth structure is firmly made in the loom.

The analysis of a good quality India linon fabric shows the following data: Ends per inch, 108; picks per inch, 110; finished width, 36 inches; warp, 90s; filling, 110s. Each selvedge consists of 16 ends of 2-90s.

The yarns were reeded 2 ends per dent in the loom. The selvedges were also reeded 2 ends per dent, i. e., 2-ply yarns. Two of these would be equal to 4 of the single yarns.

Woven with about 94 ends per inch in the loom, it will be seen that a very

fine reed has been used. This was necessary in order that an even surface, practically free from reed marks, should result.

LOOM REQUIRED.

The goods may be woven on a single box plain loom of not too light construction. On account of the fairly large number of picks per inch and the fine quality of cloth, a firm, steady take-up motion on the loom is necessary.

The ends are drawn in in the regular 1, 3, 2, 4 skip shaft order, on twine harnesses. One warp beam only is required. Practically all fabrics usually woven on cam looms may also be woven on dobby looms, if necessary.

To weave the fabric under consideration, on a dobby loom, the ends should be drawn in straight on at least 8 harnesses to prevent overcrowding of the heddles.

FINISHING.

A good finish for these goods is to singe, wash, bleach, size or starch with a light Indian corn or potato starch, the former material being preferable; then calender, dry and make up as required. A second dampening and calendering, following the first calendering, improves the quality of the finish. Very little stiffening or starch is used because the goods are intended to be washed frequently. When finished, the goods have the appearance of a smooth linen finished lawn. They are slightly glossy.

Carding and Spinning Particulars.

The division of mills that make the yarns that India linon is composed of is the third. This division of mills, as given in a previous article, is the one that makes the finest yarns and is equipped with machinery suitable to do this. India linon is made from a good quality of Sea Island cotton of about 1⅝ to 1¾ inch staple. For this class of goods it is quality and not quantity that is the main consideration. The cotton is mixed as has been described in previous articles, the good sliver being mixed in at this point, as well as laps that are too light and cut sliver waste, if any is made at any of the processes. Some overseers put cut sliver through the last process again, and let it go at that, but the only proper method to remedy this kind of work is to put it back into the mixing.

FOR THIS FABRIC

the cotton is put through two processes of pickers, and an opener. The opener should be kept as full as possible so that as even a feed as possible will be obtained. The breaker picker is generally equipped with a two-bladed rigid type of beater, the speed of which is 1,200 revolutions per minute. Some overseers prefer a pin beater, but others claim that it puts neps into long-staple cotton. This is undoubtedly due to improper setting as well as not running it at the proper speed. The weight of the lap at the front of this picker is 32 pounds or a 9¾-ounce lap. These laps are doubled 4 into 1 at the finisher picker. This picker has a two-bladed beater, whose speed is 1,050 revolutions per minute, or about 29 beats per minute. The speed of this beater should be just high enough to get the dirt out of the cotton and not injure it. The total weight of the lap at the front of the picker is 30 pounds or a 9½-ounce lap. A variation of 6 ounces either side of standard is allowed; if laps weigh outside of this they are either put through the finisher picker again or if a great deal too light or too heavy they are put back into the mixing again. These laps are put up at the card. The cards used for this stock should be kept free of all dirt, etc., and the card fillet should be kept sharp and parts properly set to each other. The flats should make

ONE COMPLETE REVOLUTION

every 35 minutes, the licker-in speed should not exceed 280 revolutions per minute, and the weight of the sliver at the front should be 40 grains per yard. It is an important point that the cards should be kept extra clean. The production of a card for a week of 60 hours should not exceed 275 pounds. The draft should be not less than 130. After passing through the cards, the sliver is generally put through sliver lap, ribbon lap and comber processes. At the sliver lap the doublings for an 8¾-inch lap are 14 into 1. The weight of a yard of lap at the front of this machine is 220 grains. These laps are put up at the ribbon lap machine and doubled 6 into 1. The weight of a yard of sliver at the front of this machine is 210 grains. These are put up at the comber and doubled 6 into 1 if a six-head comber, or 2 into 1, if comber is an eight-head comber. Set and time the comber for this stock the same as given in a previous article on Sea Island cotton. Keep all parts of comber that the cotton comes in contact with well polished and free from dirt. If more than one end

breaks on the table the sliver at the front should be broken before entering the coiler and the broken ends pieced up before the sliver is allowed to enter can. If any single has entered the can, it should of course be removed and the end properly pieced again; be sure and make a good piecing, not one that will break back at the succeeding process or one that will not draw out. The sliver is then put through three processes of drawing, the doublings of which are all 6 into 1. The weight of the drawing at the front of the finisher drawing should be 65 grains per yard. For

THIS CLASS OF WORK

leather top rolls are generally used. These should be kept well oiled and varnished and in perfect order. The drawings should be sized four times a day and the ribbon lap at least once a day. Look out to see that your stop-motions are all in perfect order and working. Be sure that there are no laps on the third bottom steel roll or in fact on any roll, as this will tend to produce cut sliver as well as throw the size out. Keep drawing on heavy size of standard weight. This sliver is next put up at the slubber and drawn into .80 hank roving. The bottom steel rolls should be a little larger in diameter than when used for shorter staple. This is in order to prevent licking. The clearers on the slubber should be picked frequently and not allowed to collect until they drop down and pass into the work. The hank roving at the fly frame is as follows: for filling first intermediate, 2.25 hank; second intermediate, 5 hank; fine, 20 hank; for warp yarn,first intermediate,2.25 hank; second, 5 hank, and fine, 18 hank; for the selvedge yarn use the same hank roving as for the warp yarn. On this grade of stock the slubber rolls should be varnished and some overseers varnish the front rolls of their first intermediate frame. The leather top rolls should be

IN PERFECT CONDITION

and special care should be given to the rail or carriage and the parts that operate it to see that they change sharply and that there is no dwell at the top and bottom of the bobbin, for this may cause it to run over or under and make a bad bobbin, or if this does not happen, it will break back at the spinning frame or mule every time it gets to the top or bottom of the bobbin, thus causing a lot of trouble, besides the liability of singles, which should be looked out for at all processes. Full bobbins should never be thrown into the boxes, but should be packed. The roving for filling may be taken to either the mule or spinning room; if the latter, use a frame having a 5-inch traverse, 1¼-inch diameter ring and a spindle speed of 7,400 revolutions per minute. This yarn is then conditioned,then it is ready to use. The warp yarn is frame spun on a frame having a 2¾-inch diameter ring; 5-inch traverse, and a spindle speed of 9,400 revolutions per minute. This yarn is put through the spooler and warping processes and from here to the slasher, where sufficient beams are put up at the back to give the required number of ends at the front. For this class of goods the following size mixture may be used: Water, 100 gallons; potato starch, 70 pounds; tallow, 7 pounds; Yorkshire gum, 3 pounds; white soap, 2 pounds; boil two hours and let stand ten hours. Before using, keep agitator running, and keep size at almost boiling point.

Dyeing Particulars.

PINK.

Two ounces diamine fast scarlet 4 B; ½ pound sal soda; 20 per cent Glauber's salt.

PEARL.

Two ounces thion violet black A; 3 ounces thion black T B C; 1 per cent sulphide sodium; 1 per cent soda ash; 20 per cent salt.

NAVY BLUE.

Ten per cent immedial indone B B; 10 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

LIGHT BLUE.

Five per cent immedial sky blue F; 5 per cent sulphide soda; 1 per cent soda ash; 20 per cent salt.

ECRU.

Four ounces thion brown G; 1 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

SAGE GREEN.

One per cent thion green G; ½ per cent thion yellow G; 1½ per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

BROWN.

Eight per cent thion brown G; 2 per cent thion brown O; 10 per cent sulphide sodium; 2 per cent soda ash; 30 per cent Glauber's.

MYRTLE GREEN.

Two per cent thion yellow G; 6 per cent thion green G; 8 per cent sul-

phide sodium; 2 per cent soda ash; 30 per cent Glauber's salt.

SLATE.

Four ounces thion black T R; ½ per cent sulphide sodium; 1 per cent soda ash; 15 per cent Glauber's salt.

TAFFETA SILK LINING OR TAFFETINE.

This is a fabric made with a silk warp, cotton, linen or wild silk filling. Taffetine is a term variously used at different times; specifically it is a fine, glossy, closely woven, uncorded and untwilled fabric, used entirely for ladies' wear in the form of a lining, underskirts, etc. Taffetine derives its name from the more costly fabric, taffeta. This fabric is of

QUITE ANCIENT ORIGIN,

being in use as early as the 16th century as a dress fabric for both men and women. Taffeta of the 16th century was a thick, costly fabric, made with silk and wool. In the 17th century the fabric was defined as a soft, thin fabric. In the transition the goods have undergone a complete change of texture and in the 18th century taffeta was a very lustrous silk fabric, sometimes checked or flowered or striped with gold and silver.

The taffetine under consideration is a fine, plain-woven fabric with warp threads per inch greatly in excess of filling threads per inch and the warp of a much finer count than the filling.

THE FINEST QUALITIES

of fabrics are made on this basis. The warp yarn for these goods is invariably raw silk, technically known as organzine or thrown silk, and the filling may be cotton, linen or artificial silk.

The raw silk used for filling in silk fabrics is technically known as tram silk. This is similar to the organzine; the difference lies in the twisting of the filaments. These filaments are put together very loosely with

LITTLE OR NO TWIST;

consequently, they are not as strong as the more firmly twisted fibres, but sufficiently strong to answer as filling.

When the filaments cannot be drawn from the cocoon in one continuous thread, due generally to the cocoon being damaged by the worm in eating its way out, these cocoons are torn up and the filaments are combed and laid parallel to one another, and the thread made from the damaged cocoons is known as spun silk.

The spun silk is not as smooth or as fine as the raw silk thread, although some of the fibres are of considerable length and strong enough to be used for warp threads. Spun silk is calculated by the weight of 1,000-yard same basis as cotton, namely, 840 yards to 1 hank, or, 840 yards of No. 1s equal one pound. Raw silk is calculated as to the size of thread, on the hanks in drams avoirdupois; thus, if one hank weighs 1 dram, it is known as 1 dram silk, or 256,000 yards equal 1 pound.

THE FILLING

for these fabrics is either cotton, linen or wild silk. Linen filling is used in the best grades of taffetine; linen yarn is prepared similarly to worsted thread, notwithstanding that linen is a vegetable fibre. The raw flax is first beaten or crushed in order to make it pliable; then it is combed, or passes through the process technically known as scutching. Flax fibres must be of a certain length in order to work properly. If too long, they are broken in a machine called a saw.

After the fibres are combed they are carded and the long fibres are spun into linen yarn, while the short fibres are converted into what is known as tow yarn. Taffetine is sold in both narrow and wide widths. The narrow fabric is usually about 19 inches wide. This narrow fabric is commonly

WOVEN DOUBLE WIDTH,

then cut in two after the fabric is woven.

In order that the ends may not fray out after the fabric is cut, the goods are made with a fast centre selvedge. In warping, extra ends are allowed just as in an ordinary outside selvedge. In the centre of the warp, these ends are reeded double as is the common practice for reeding selvedges, leaving one or more dents empty where the fabric is to be cut.

Fast centre selvedges are extensively used in the manufacture of ribbons, scarfs, cheaper grades of cassimeres and, in fact, any fabric characterized by its narrowness.

The fast centre selvedge consists of crossing one thread over two or more threads, similarly to the douping of threads in leno weaving.

See diagram, Fig. 1.

The douping or crossing of threads is effected by an attachment on the back of the loom, directly in the cen-

tre of the loom if but two pieces are to be woven; the threads that are crossed rest stationary in the attachment, while the crossing threads cross over from one side to the other at each pick or every two picks as may be desired. The crossing thread and the threads over which it crosses must be reeded in the same dent, as in leno weaving.

ANALYSIS.

Width of warp in reed, 40 inches, double width; width of fabric finished, 19 inches, single width; ends per inch finished, 106; ends per inch in reed, 100.

Reed, 50x2; ends in warp, double width, 3,920; outside selvedges, 80; centre selvedges, 80; equals total of 4,080 ends in warp.

Take-up during weaving, 10 per cent; warp, 1¼ dram organzine silk. Filling, 1-50s combed and gassed cotton; 88 picks per inch.

LOOM REQUIRED.

Plain woven silk warp fabrics may be woven on any light smooth-running loom. The essential consideration is the heddles. For this class of fabrics the French string heddles are considered the best, as they are less liable to break or chafe the warp during the process of weaving in comparison with the ordinary wire heddle.

FINISHING.

The goods require little in the way of finishing. After the fabric is dyed it is slightly stiffened by immersing in a light solution of size. The stiffening and the materials used in the construction of the fabric produce a crisp and rustling effect.

Carding and Spinning Particulars.

Taffetine is composed of yarns made in the second division of mills as given in a previous article. These mills are equipped with combers. The warp yarn of the fabric under description is silk and the filling yarn is cotton. For this class of fabric two kinds of raw stock may be used, either a medium staple Sea Island cotton, or an Egyptian cotton. We will assume that an Egyptian cotton of good grade and of 1⅜-inch staple is used. As Egyptian cotton is

MORE EASILY WORKED

than American cotton, the speeds at which the different machines are run are higher, as will be noted by comparing this article with some of the other articles in which an American cotton of the same grade and length of staple has been described. Egyptian bales of cotton are baled better and compressed more tightly than American bales, the average weight being 800 pounds, instead of 500 pounds, as compared with the American bales. The cotton should be allowed to stand in the bins a little longer than the American bales, so as to allow the cotton to expand. The good waste from the machines up to the slubber is put into the mixing. The cotton is then passed through either two or three processes of

PICKING

and an opener. Keep the opener well filled with raw stock so that as even a feed as possible may be obtained. The speed of the beater at the breaker picker is 1,500 revolutions per minute and the total weight of the lap at the front is 40 pounds or a 20-ounce lap. These laps are doubled 4 into 1 at the intermediate picker. The speed of this beater is 1,450 revolutions per minute. The total weight of the lap at the front is 37½ pounds or a 12-ounce lap. The

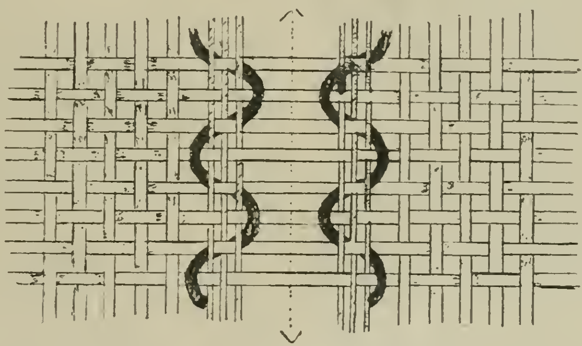


Fig. 1.
Dotted line indicates where fabric is to be cut.

doublings at the finisher picker are 4 into 1, the speed of the picker being 1,450 revolutions per minute. The total weight of a lap at the front of the picker is 35 pounds or a 12½-ounce lap. These laps are put up at the card. The licker-in speed is 350 revolutions per minute. The flats make one complete revolution every 30 minutes, and the cylinder 160 revolutions per minute. The draft of the card for this class of goods is 135. The sliver at the front weighs 45 grains per yard and the production for a week of 60 hours is 550 pounds. Use the same

SETTINGS AT THE CARD

as have been previously given for 1⅜-inch-staple American cotton. The grinding and stripping times are also the same. The sliver is next put through a sliver lap machine, when it is doubled 14 into 1 for an 8¾-inch lap. The draft of this machine is about 2. The bottom steel rolls are spread as follows for this staple of cotton: Front to middle, 1⅝ inches; middle to back, 1⅞ inches. The weight of a yard of lap at the front is 295 grains. These laps are doubled 6 into 1 at the

RIBBON LAP MACHINE.

The bottom steel rolls of this machine are spread as follows: Front to second, 1½ inches; second to third, 1⅝ inches; third to back, 1¾ inches. The weight of a yard of lap at the front of this machine is 275 grains. A size of the lap at this machine should be taken once a day. A variation of 2 grains either side of the standard is allowed before changing the draft gear. These laps are put up at the comber and doubled according to the number of heads that the comber contains—generally 6 or 8. If a six-head comber is used, six laps would be put up at the back. The percentage of waste taken out for this stock is 18. The settings of the draw box rolls are: Front to middle, 1 7-16 inches; middle to back, 1½ inches. The speed of the comber is 90 nips per minute. The timings and settings are the same as given in a previous article. The percentages of the combers should be taken regularly, the general method being to take so many combers a day. Keep needles in good condition and straight and free from waste. See that the half lap needles are in good condition, and that the timings and settings are as they should be. About two combers a week should be scoured by a comber man and his helper. The weight of a yard of sliver at the coiler of this machine is 40 grains. This sliver is next put through two processes of

DRAWING FRAMES,

the doubling being either 6 ends up at both processes or, as is often done, 8 ends up at the breaker and 6 ends at the finisher. The weight per yard of the sliver at the finisher drawing is 74 grains. The top rolls used may be either metallic or leather. The settings of the rolls are as follows: Front to second, 1½ inches; second to third, 1⅝ inches and third to back, 1¾ inches. This setting is for leather rolls. If metallic rolls are used, set ⅛ of an inch wider. Size at the drawing frame four times a day. At the slubber the sliver is drawn into .50 hank roving, after which it is put through three processes of fly frames, the hank roving at each process being as follows: First intermediate, 1.25; second intermediate, 3; and fine frame, 10 hank. This cotton requires 1 tooth more twist than American cotton for the same hank roving. Set the jack frame bottom steel rolls as follows: Front to middle, 1 7-16 inches and middle to back, 1½ inches. Size 10 hank roving once a day. Watch the usual points at the speeders that have been already pointed out in previous articles.

THE FILLING

is either mule or frame spun, generally mules being used for this class of goods. If frame spun, the requirements of a frame are as follows: Gauge of frame, 2¾ inches; diameter of ring, 1¼ inches; length of traverse, 5½ inches; speed of spindles, 8,200 revolutions per minute. The yarn is then run over or through a gas flame to take off all fuzz and give it a lustre.

Dyeing Particulars.

The dyeing of goods composed of silk and cotton is generally done in open vats provided with a winch, in some cases also on a jigger if the material to be dyed requires it. Colors which dye silk and cotton are used, dyeing first with the substantive color, with soap and phosphate of soda, or common salt and a little sal soda. Should the silk require colors to be made a little brighter, acid colors are used in a bath of soap and acetic acid, or a basic color is dyed in a soap bath with acetic acid, the color dyeing both the cotton and silk a brighter shade. For pale shades: 10 gallons liquor; 5 ounces soap; ½ ounce sal soda; 3 ounces phosphate soda. For heavy shades: 10 gal-

36", 124 x 120, 8.1 yds

lons liquor; 6 ounces soap; ½ ounce sal soda; 6 ounces phosphate soda; 10 ounces Glauber's salt. The temperature of the dye bath is generally about 195 degrees F. After dyeing, the pieces must be well rinsed, and raised with acetic acid, in cold water: 10 gallons water; 1½ pints acetic acid.

BLACK.

Eight per cent union black S; 1 per cent diamine fast yellow A; 30 per cent Glauber's; 2 per cent sal soda; 2 per cent soap. Top with alizarine black 4 B.

SEA GREEN.

One-half per cent diamine black H W; 4 ounces diamine fast yellow B; topped with new methylene blue N; new phosphine G.

For 10 gallons dye liquor: 6 ounces soap; ½ ounce sal soda; 3 ounces phosphate soda.

NAVY BLUE.

Three per cent diamine dark blue B; 1 per cent diamine brilliant blue G; topped with new methylene blue N X; metaphenylene blue B; indigo blue N.

PEARL.

Two ounces diamine gray G; 1-16 ounce diamine brown M; topped with aniline gray B.

SLATE.

Ten ounces diamine gray G; ⅛ ounce diamine brown M; topped with cyanol extra, orange extra.

LIGHT MAUVE.

One ounce diamine violet N; ½ ounce diamine brilliant blue G; topped with methyl violet B I.

VIOLET.

One per cent diamine violet N; ½ per cent diamine brilliant blue G; topped with methyl violet B I.

PINK.

Two per cent diamine rose B D; topped with rhodamine G.

RED.

Three per cent diamine fast red F; topped with safranine S 150; acid violet 4 R S.

SKY BLUE.

Four ounces diamine sky blue F F; topped with cyanol extra.

LIGHT BROWN.

One per cent diamine brown B; ½ per cent diamine yellow B; topped with Bismarck brown F F; thioflavine T.

MYRTLE GREEN.

Two per cent diamine black H W; 2 per cent diamine green B; 1 per cent diamine fast yellow B; topped with brilliant green; new methylene blue N.

SCARLET.

Three per cent diamine fast scarlet G B; ½ per cent diamine orange D C; topped with safranine G G S; tannine orange R.

CREAM.

One-quarter ounce diamine gold; ¼ ounce diamine orange B; 1-16 ounce diamine fast yellow B.

STEEL.

One-eighth ounce diamine gray G; topped with cyanol extra; aniline gray B.

VICTORIA LAWN.

Victoria lawn is a fabric resembling to a great extent a fabric previously explained, linon. It is usually made with slightly heavier yarn in the warp and contains a greater number of ends and picks per inch. It is very firmly woven.

It is especially used for aprons and ladies' heavy undergarments, having excellent wearing and washing qualities.

The usual widths are from 32 inches to 36 inches.

They are made in different grades. Retail prices for some are 12 and 15 cents for the 32-inch width, 23 cents, 27 cents, 32 cents and 38 cents for the 36-inch width.

A typical fabric, weighing about 8¾ square yards per pound, is constructed as follows: 124 ends per inch, 120 picks per inch, 36 inches wide, finished.

CALCULATIONS.

Thirteen square inches of the cloth under consideration weigh 8 grains. To find the number of yards per pound:

$$\frac{13 \text{ (sq. in.)} \times 7{,}000 \text{ (grs. per lb.)}}{8 \text{ (grs.)} \times 36 \text{ (cloth width)} \times 36 \text{ (inches per yard)}} = 8.777 \text{ yards per pound.}$$

To find the average number or count of yarn in the cloth:

124 (ends per inch) + 120 (picks per inch) = 244.

$$\frac{244 \times 8.777 \text{ (yds. per lb.)} \times 36 \text{ in.}}{764 \text{ (10\% allowed for contraction and size 764 used instead of 840)}} = 100 \text{ average number.}$$

ANOTHER METHOD

of finding the average number, without taking into consideration the number of yards per pound, is as follows:

Multiply the sum of the slay and pick by the number of square inches weighed and by .254 and divide by the weight in grains.

This is a simpler method, as will be seen by comparing the number of figures that have to be used in the two methods:

$$\frac{244 \times 13 \times .254}{8} = 100 \text{ average number.}$$

.254 in the above example is a constant obtained by dividing 7,000 (grains) by 36 (inches) and by 764 (yards per hank). The latter is used instead of 840, allowing 10 per cent.

The counts of the yarns are: warp, 85s; filling, 130s.

The weight of the warp yarns may be obtained as follows: 124 (ends per inch) times 36 inches (finished width) equals 4464. 4464 plus 40 for selvedges equals 4504, total number of ends in warp.

$$\frac{4504 \times 105 \text{ (length of warp)}}{85 \text{ (counts of warp)} \times 840} = 6.623 \text{ lbs. of warp in 100 yards of cloth.}$$

6.623 plus 5 per cent for size equals 6.954 pounds, weight of warp and size.

To find weight of filling: 120 (picks per inch) times 40 inches (width in reed) equals 4,800 yards of filling in one yard of cloth.

$$\frac{4{,}800 \times 100 \text{ (cloth length)}}{130 \text{ (filling counts)} \times 840} = 4.392 \text{ lbs. of filling in 100 yards of cloth.}$$

6.954 lbs. warp and size.
4.392 lbs. filling.

11.346 lbs., weight of 100 yard piece.

100 divided by 11.346 = 8.8 yards per pound.

The fabric under consideration, if woven on a dobby loom, could be woven on about 8 harnesses, straight draw, the ends in the body of the cloth being reeded 4 in a dent. The selvedge ends work 2 as 1, 2 doubles in 1 dent. The weave is plain throughout. A 12-harness straight draw, the ends reeded 3 in a dent, could be substituted.

LOOM REQUIRED.

The remarks made in connection with the preceding article, ninon, also apply here. A single box cam loom, firmly made, one beam, is the best to use. Dobby looms, although capable of weaving goods of this class, are not usually run at as high a rate of speed as cam looms.

FINISHING.

The finishing process includes singeing, washing, bleaching, very light starching, drying and pressing, or calendering.

STARCHING.

After a bleaching process, the pieces are given a very good starching with 4 ounces of German white dextrine to a gallon of water, boiled for one hour, and starched through a mangle, and dried over a tenter frame, care being taken to have the goods perfectly straight.

Carding and Spinning Particulars.

The counts of yarn of which Victoria lawn is composed are made in the second and third divisions of mills as given in a previous article. The counts of yarn of which the sample under description is made are 85s warp and 130s filling. Both warp and filling yarns are combed. The cotton used for the filling yarn is 1¾-inch staple Sea Island stock and that used for the filling is either a long-staple peeler or a 1⅝-inch Sea Island. We will assume that both yarns are made from Sea Island stock. The cotton would first be opened, as has been previously explained, and put through an opener, and either one or two processes of picking, generally two processes being used; but it is the opinion of a great many carders that

ONE PROCESS IS BETTER

because of the fact that the more picking this cotton is given, the more neps are liable to be put in. The mixing is generally done by hand and not by machine, for the same reason. The cotton should be passed through the opener in the usual manner and should pass on to the lattice apron of the breaker picker, if two processes are used, and from here passed

through the feed rolls and to the action of the beater. This beater is generally of the two-bladed, or armed, type, and for this cotton there should only be made sufficient revolutions per minute to take out the dirt. The speed of the beater is 1,150 revolutions per minute, if two processes of picking are used. The weight of the lap at the front of this picker is 32 pounds, or a 10-ounce lap. These laps are put up and doubled 4 into 1 at the finisher picker, the speed of the beater being 950 revolutions per minute. The beats per minute for this stock are 29. The total weight of the lap at the front is 28 pounds or a 9½-ounce lap to the yard for the 1¾-inch stock and a 10½-ounce lap for the 1⅝-inch stock. A variation of ¼ pound is allowed either side of standard for 1¾-inch stock and ½ pound for 1⅝-inch stock. It is understood that every lap must be weighed. The lap is next put up

AT THE CARD

and the draft for the longer staple should not be less than 150 and for the shorter staple 135. The flats should make one revolution every 35 minutes and the speed of the beater should be reduced to 275 revolutions per minute for the same reason as given for the reduction of the speed of the beater of the picker. The counts of the wire used for the fillet should be 35s for cylinder and 37s for doffer and top flats. Special care should be given to the setting and grinding of the fillet for these cards, the wire being always kept sharp. Use the same settings as given in a previous article for this same grade of stock. The

WEIGHT OF THE SLIVER

should be about 35 grains per yard for the 1⅝-inch stock and 32 for the 1¾-inch stock. The production is 250 pounds per week of 60 hours for 1¾-inch stock and 275 to 325 pounds for 1⅝-inch stock. Both card slivers are taken to the sliver lap machines and doubled 14 into 1 for an 8¾-inch lap. The weight of a yard of sliver lap at this machine is 220 grains. These laps are doubled 6 into 1 at the ribbon lap machine, the weight of the lap being 210 grains per yard for both stocks. The laps of the ribbon lap and sliver lap machines should be weighed once a day and the weights changed at the ribbon lap machine to keep the laps at standard weight. The laps are next put up

AT THE COMBER

and doubled either 6 or 8 into 1, according to the number of heads that the comber contains. The setting and timing of the comber for this stock have been previously given. The draw box rolls should be set from the 1¾-inch stock as follows: Front to middle, 1 13-16 inches, middle to back, 1⅞ inches. It sometimes happens that the draw box will not allow the rolls to be spread this distance and about the only method to overcome this defect in this machine, as well as in other machines where a like difficulty occurs, is to reduce the draft between the middle and back rolls so that the speed of the rolls will be equal, and set rolls just to staple, which will avoid breaking the cotton; but this has the fault of bringing all the draft between the middle and front rolls. The weight of the sliver at the comber for this stock is 35 grains per yard for both stocks. The percentage of waste taken out for the 1¾-inch staple is 25 per cent and for the 1⅝-staple is 22 per cent. This sliver is next put through two processes of

DRAWING.

These drawings should be equipped with leather top rolls and especial care should be given to the leather top rolls of the sliver lap, ribbon lap, comber and drawing frame machines. The leather detaching rolls of the comber require a somewhat rougher varnished roll than the others, the leather rolls used for the other machines having a smooth, glossy finish. The varnish used for all the rolls should be that which will prevent all licking. The weight of the sliver at the finisher drawing should be 60 grains per yard for both stocks, the doublings at each process being 6 into 1. At the slubber this is made into .80 hank roving. The front top rolls should be of a larger diameter than those used for shorter staples and should be varnished with a varnish which will give them a smooth, glossy finish. The settings should be 1⅞ inches from front to middle and 2 inches from middle to back. The slubber roving is then put through three processes of fly frames and made into 18 hank roving for 1⅝-inch stock, the hank roving at each process being as follows: 1st intermediate, 2.25 hank; 2d, 5 hank; and fine 18 hank. Sometimes the front rolls of the 1st intermediate fly frame are varnished. This yarn is next put through

THE SPINNING FRAME

and made into 85s on a frame having a 5-inch traverse, 1⅜-inch diameter

ring and a spindle speed of 9,400 revolutions per minute. From here it is spooled and warped and put through a slasher. The roving for the filling yarn is put through three processes of fly frames, the hank roving at each process being as follows: 1st, 2.25 hank, second 7.75 hank and fine 24 hank. This is mule spun into 130s and from here is taken to the conditioning room.

BIAZ, OR LINEN FINISH SUITING.

Biaz is a medium-grade cotton fabric resembling linen in appearance. This effect is usually obtained on ordinary cotton yarns in the finishing process, or in somewhat easier form, by using mercerized yarns or mercerizing the fabric in the piece. They are usually shown white.

The term biaz is an uncommon one in this country. It is an Asiatic native name, pronounced be'az.

ORIGIN.

The goods are said to have originated at Biaz, a place in the central part of Asia, and to be still manufactured there for home use and for export to Russia. The goods bearing this name are better known in America as "linen finish suitings," and are principally used for ladies' summer suitings. The eastern goods are more heavily filled with foreign matter than ours and are used for various purposes.

ANALYSIS.

The analysis of a typical biaz fabric shows the following data: Ends per inch, 56; picks per inch, 44; finished width, 32.5 inches; weight. 4.57 yards per pound; warp, 19s; filling, 20s; the ends were reeded 2 in each dent. The weight would probably be considered 4½ yards per pound.

CALCULATIONS.

To find number of yards per pound.

A small piece 4 in. x 3 in. weighs 15.7 grs. 4x3 = 12 sq. inches.

$$\frac{12 \text{ (sq. in.)} \times 7{,}000 \text{ (grains)}}{15.7 \text{ (grains)} \times 32.5 \text{ (width)} \times 36 \text{ (inches per yard)}} = 4.57 \text{ yards per pound.}$$

To find average counts of yarn in the cloth:

56 ends + 44 picks = 100.

$$\frac{100 \times 32.5 \text{ (width)} \times 4.57 \text{ (yds. per lb.)}}{764} = 19.4 \text{ average count.}$$

or

$$\frac{100 \times 12 \text{ (sq. in.)} \times .254 \text{ (constant)}}{15.7 \text{ (grains)}} = 19.4 \text{ average counts.}$$

The sizes of the yarns are about equal. For practical purposes a warp of 19s and a filling of 20s would answer.

LOOM REQUIRED.

This fabric may be made on any of the light, fast running cam looms. On account of the small number of ends per inch a set of two-twine harnesses would be preferable. One warp and one shuttle only are required.

FINISHING.

The finishing of biaz is really the principal characteristic which distinguishes it from many other plain woven cloths. It has a more glossy effect than Indian linen, one finishing process being somewhat similar to that of the latter fabric, with the beetling process added.

A finish suitable for this cloth is as follows: Bleach, mangle and dry; fill with a light starch on the starch mangle; stretch and dry. After drying and cooling, it is run through the damping machine; then through the glazed calender on both sides, under very heavy pressure. The cloth is then dampened, beetled, changed and turned, and again beetled and made up as required.

Carding and Spinning Particulars.

For biaz the same instructions may be followed as were given in the article on indigo prints, with the following exceptions:

The slubber roving is .50 hank and this is put through two processes of fly frames. At the first intermediate the roving is made into 1.20 hank and at the second into 3.50 hank. This is then passed directly to the spinning room and spun into 19s warp yarn on a frame having a 2¾-inch gauge, two-inch diameter ring, 7-inch traverse; 20.71 twist per inch and a spindle speed of 9,400 revolutions per minute. This is then spooled and warped, after which several warps are put up and run through the slasher and run upon a beam having the required number of ends wanted for weaving. The filling yarn is spun into 20s on a frame hav-

ing a 2¾-inch gauge, 1½-inch diameter ring, 6½-inch traverse, 14.53 twist per inch, and a spindle speed of 7,300 revolutions per minute, after which the yarn is conditioned.

Dyeing Particulars.

OLIVE.

Five per cent pyrol olive G; 5 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

BRONZE.

Five per cent pyrol bronze G; 5 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

BLACK.

Ten per cent thiogene black M conc.; 10 per cent sulphide sodium; 2 per cent soda ash; 25 per cent salt.

SLATE.

One per cent thion black T B C; 1 per cent sulphide sodium; 1 per cent soda ash; 10 per cent salt.

ECRU.

Three-quarters per cent thion brown G; 1 per cent sulphide sodium; 1 per cent soda ash; 10 per cent salt.

RED.

Six per cent diamine fast red B B; 2 per cent sal soda; 25 per cent Glauber's.

BROWN.

Five per cent immedial brown B; 5 per cent immedial cutch O; 10 per cent sulphide sodium; 3 per cent soda ash; 30 per cent salt.

SKY BLUE.

One and one-half per cent thion blue B conc.; 1½ per cent sulphide sodium; 1 per cent soda ash; 20 per cent salt. Develop with peroxide of hydrogen.

NAVY BLUE.

Eight per cent thion navy blue R; 8 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt. Develop with peroxide of sodium.

COBURG SUITING.

Coburg, of which there are several varieties, may be defined as a thin dress fabric made from cotton and worsted or cotton and silk.

Coburg derives its name from the city of Coburg, in Germany, where it was first manufactured. The all-cotton fabric known as coburg is an inexpensive dress fabric imitating the genuine fabric principally in the character of the weave only.

The weave for these fabrics is an

UNEVEN-SIDED TWILL,

giving the face of the goods a very pronounced twill effect. The accentuation of the twill is in part due to the number of ends per inch used in the construction of the goods. The ends per inch in the sample under consideration equal twice the number of picks per inch.

This is somewhat in excess of the number of ends required to make perfect cloth. A perfect cloth is understood to mean a cloth in which the warp and filling yarns are equal in diameter, and the space between the threads is equal to the diameter of the yarn. This principle of construction applies particularly to plain woven cotton fabrics, more so than to any other class of fabrics. In fabrics of a special construction, such as coburg, the ends per inch are more or less crowded, with the consequent result of a pronounced twill effect on the face of the fabric, which characterizes the goods.

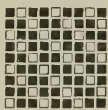


Fig. 1.

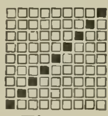


Fig. 2.

Cotton coburgs are commonly made with a three-harness twill weave $\frac{2}{1}$. The ends per inch required in order to produce a perfect cloth, according to the above principle of constructing a perfect fabric, with the given counts of yarn, would be as follows:

Weave repeats on three ends with two intersections. Three ends plus two intersections equals 5; as 5 : 3 :: 120, the number of ends that will lie side by side of 1-20s cotton in one inch.

Formula: 5 : 3 :: 120 : x equals 72.

The calculation shows that 72 ends and 72 picks of 1-20s would give a perfect cloth.

In some fabrics an analysis will show 120 ends and 54 picks in the finished fabric. The inequality of ends and picks per inch characterizes cloths of special construction, as the fabric in question. Cotton coburgs are principally used for dress goods, made up

into wrappers, shirtwaists, shirtwaist suits, etc. The goods are woven in the gray, then dyed and in most cases printed or bleached and then printed. The goods, however, have no particular coloring scheme or style of printed patterns. Some are finished in pure white or bleached without any printed pattern. Again they may be dyed any color desired. In most cases the goods are dyed and printed. The characters of patterns that are most popular in this class of goods are small geometrical figures or small conventionalized floral figures in but one or, at the most, two colors.

ANALYSIS.

Width in reed, 37½ inches; width,

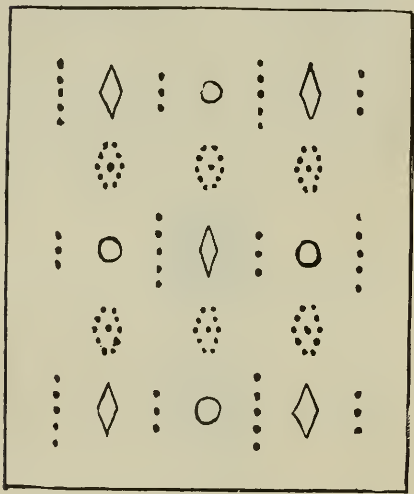


Fig. 3.

finished, 36 inches. Reed, 1,400x3; number of ends in warp, 4,374; 26 ends selvedge; equals 4,400 number of ends.

Number of ends, per inch, finished, 120; number of picks per inch, finished, 54; take-up in weaving, about 10 per cent; warp yarn, 1-26s cotton; filling yarn, 1-26s cotton.

Fig. 1. Three repeats of weave; twill running to the left.

Fig. 2. Drawing-in draft.

The warp may be drawn in on 6 harnesses; 9 harnesses would avoid crowding of the harnesses and give better results in weaving.

Fig. 3. A sample of printed pattern.

LOOM REQUIRED.

Common cotton fabrics as a rule may be woven on almost any light running high speed loom. Twill weaves, in which more than four harnesses are required, are usually woven on dobby looms. A Northrop dobby loom would answer for the class of goods analyzed. Broken or miss picks in these fabrics are hardly noticeable, the filling showing very little of itself on the face of the fabric.

FINISHING.

The goods are first all boiled off, then dyed or bleached, as may be required, after which they are slightly stiffened by running through a light solution of size, then printed, after which they are made up into laps and then shipped.

Carding and Spinning Particulars.

Under most conditions the same instructions given for indigo prints may be followed. The main point of difference is that of the hank rovings at the slubber and fly frames or speeders. At the slubber the hank roving is .40 and at the first intermediate 1.50, while at the second intermediate it is made into 5.25 hank roving. This roving is then ring spun into 26s for both the warp and filling yarns. For the warp yarn use a frame having a 6½-inch traverse; 1¾-inch diameter ring; 2¾-inch gauge of spindle and a spindle speed of 9,700 revolutions per minute.

THIS YARN

is then run on a spooler, after which the spools are put up and run on to a beam. Several beams are then put up at the slasher, being run through this machine to be sized and run on to a beam at the head end. The filling frame has a 2¾-inch gauge; 1⅜-inch diameter ring; 6-inch traverse; 17.84 twist per inch, and a spindle speed of 8,000 revolutions per minute. After being made, the yarn should be conditioned by putting it into a steam chest or some similar compartment, although some mills merely immerse the full boxes of yarn into a tank of water and take them out immediately.

Dyeing Particulars.

For cotton warp coburgs:

BLACK.

Five per cent union black S; 30 per cent Glauber's salt.

WINE.

Three and one-half per cent diamine Bordeaux B; 30 per cent Glauber's salt.

LIGHT BLUE.

One and one-half per cent diamine sky blue F F; ½ per cent diamine steel

blue L; 8 ounces thiocarmine R powder; 30 per cent Glauber's salt.

NAVY BLUE.

Two per cent diamine black B H; ¼ per cent naphthol blue black; ¼ per cent formyl violet S 4 B; ½ per cent union black S; 30 per cent Glauber's.

BROWN.

One per cent diamine orange B; 1 per cent diamine fast yellow B; ½ per cent union black S; 1 per cent diamine brown M; ½ per cent Indian yellow G; 35 per cent Glauber's salt.

GREEN.

Three per cent diamine green G; 1 per cent diamine black H W; 1 per cent diamine fast yellow B; 30 per cent Glauber's.

SCARLET.

Four per cent diamine scarlet B; 1 per cent fast scarlet B; 30 per cent Glauber's salt.

SLATE.

Six ounces union black; 2 ounces naphthol blue black; 1 ounce diamine Bordeaux B; 2 ounces diamine orange B; 30 per cent Glauber's salt.

For coburgs, all wool:

For 100 pounds piece goods: Dye with 15 per cent Glauber's salt, 4 per cent sulphuric acid, for light and medium shades; for dark shades add a little more if required.

SLATE.

Four and one-half ounces cyanole green B; ½ ounce acid yellow A T; 1 ounce azo orseille B B.

RED.

Five per cent naphthol red F B; 1 per cent orange extra.

OLIVE.

Two per cent cyanole green 6 G; 2½ per cent acid yellow A T.

PEACOCK BLUE.

Two per cent indigo blue S G N; 1 per cent cyanole extra.

BROWN.

Two and one-half per cent acid yellow A T; 2 per cent lanafuchsine S G; ¾ per cent cyanole green 6 G.

SKY BLUE.

One ounce cyanole F F pat.; ½ ounce acid violet 6 B S.

MAUVE.

One per cent azo wool violet 7 R; 1 ounce cyanole extra pat.

NAVY BLUE.

Three per cent azo navy blue 3 B; 1¼ per cent azo navy blue B.

BLACK.

Five per cent azo merino black B E.

KID FINISH CAMBRIC.

Kid finish cambric is a name given to a soft-finished plain cloth which is fairly lustrous on both sides, but more so on the face than on the back. It is used exclusively for dress linings. It varies in width from about 24 to 27 inches, and is shown in black and staple shades.

The fabric derives its name from its appearance after being subjected to the finishing process.

The cloth itself before finishing does not differ from many other plain cloths now shown on the market. It is fairly well filled with foreign substances; the retail price at which it is sold, about 5c. per yard for goods 24 inches wide, and the firm feel necessary, preclude the possibility of putting very much cotton into it.

The analysis of a sample under consideration shows the following: Finished width, 25½ inches; ends per inch, 64; picks per inch, 54; warp yarn, 34s; filling yarn, 38s; weight, 8 1-3 yards per pound.

CALCULATIONS.

A sample 4 inches x 3 inches in size weighs 11 grains, indicating a fabric weighing approximately 8 1-3 yards per pound.

$$\frac{2,333.33}{11 \text{ grs.} \times 25.5 \text{ in.}} = 8.31 \text{ yards per pound.}$$

Allowing 20 per cent for size and contraction, the average counts of yarns used may be found as follows:

$$\frac{118 \times 25.5 \times 8.31 \times 1.20}{840} = 35.6 \text{ average number.}$$

In the above calculation 118 represents the sum of the sley and pick, 25.5 the width of the cloth, and 8.31 the number of yards per pound.

Assuming the counts of the warp yarns to be 34s, the counts of filling required to make the given weight of cloth may be found as follows:

$$\frac{118 \text{ (sum of sley and pick)}}{35.6 \text{ (average counts)}} = 3.31.$$

$$\frac{64 \text{ (sley)}}{34 \text{ (warp counts)}} = 1.88.$$

$$3.31 - 1.88 = 1.43.$$

$$\frac{54 \text{ (pick)}}{1.43} = 37.7\text{s counts of filling required.}$$

38s filling would be used.

LOOM REQUIRED.

As these goods are not noticed very

closely after being made into garments, being hidden when in use, little attention is paid to picking out ordinary misweaves in the loom. Those that are made are covered to a more or less extent in the finishing process.

The chief consideration, therefore, is a large production, which can best be obtained from light running cam looms. Ordinary or automatic looms may be employed, one warp beam and one shuttle only being required. The cloth is reeded one end per heddle and two ends per dent.

FINISHING.

This process is really the principal one in making these goods, giving them, as it does, the characteristic name. It gives to the cloth a somewhat leathery feel, not too harsh or stiff, while yet adding a fair amount of foreign matter.

After bleaching, dyeing and mangling, the cloth is dried on the drying machine and allowed to cool. It is then conditioned on the damping machine and allowed to lie for about two hours, after which it is hot swiss calendered on a five-bowl compound lever calender, using light pressure. It is afterwards filled on an ordinary two-bowl compound lever starch mangle with a mixture somewhat as follows:

Dextrin	200 pounds
Potato starch or farina	20 pounds
Cornstarch or maize	20 pounds
Oleine oil	2½ gallons
Carbolic acid	½ pint

Water, sufficient to make 120 gallons when boiled. Boil for 15 minutes.

After being filled, the cloth is dried on the drying machine and allowed to cool, then conditioned on the damping machine and allowed to lie at least two hours. It is then hot swiss calendered on a three-bowl dead set calender, using light pressure, after which it is ready for making up.

Carding and Spinning Particulars.

The yarns for the grade of goods under description are made in mills having the equipment of those of the second division. The yarns for this fabric do not have to be combed. They are made from cotton of a middling grade of 1 1-16 to 1 3-16 inch staple. This cotton is mixed as has been previously described. The cotton should be allowed to stand as long as possible after opening before being worked. The cotton is passed through an opener and three processes of pickers. Use the usual precaution in feeding the opener, being sure to keep the pin roller clear of cotton, especially sliver waste, which is apt to wind around this roll on certain makes of openers. After passing through the opener the cotton is fed to the breaker picker. The beaters of all the pickers are of the two-bladed rigid type. The speed of the beater at the breaker picker is 1,500 revolutions per minute. The total weight of the lap at the front end of the breaker picker is 42 pounds. These laps are doubled 4 into 1 at the intermediate picker, the speed of the beater at this machine being also 1,500 revolutions per minute. The total weight of the lap at the front of this machine is 39 pounds or a 14-ounce lap. The laps are doubled at the finisher picker 4 into 1. The speed of the beater is 1,425 revolutions per minute.

THE TOTAL WEIGHT

of the lap at the front is 40 pounds or a 14½-ounce lap. An allowance of one-half pound either side of the standard total weight of lap is made for this class of goods. At the card the speed of the licker-in should be 350 revolutions per minute. Do not make the card do the work of the picker, but watch to see that the speed of the beater is correct and that the settings of the feed roll and grid and grate bars are right to take out the dirt, seed shells, bits of leaves, etc. It is too often that the licker-in is called upon to do the work that the picker should, and a kick is made that the cards are not doing their duty. The speed of the flats is one complete revolution every 55 minutes. The wire fillet used on the doffer and flats is No. 34s and on the cylinder is No. 35s. Grind and strip cards as described in a previous article. After grinding, the setting points should be all gone over. Do not have the flats too tight or they are apt to cramp and face, if not loosen, the wire on the cylinder. Be always sure to set flats to cylinder by the highest flats, generally five being left for this purpose. The weight of the sliver should be about 50 grains per yard and the production 750 to 900 pounds per week of 60 hours.

THE CARD SLIVER

is put through three processes of drawing, the doublings being 6 into 1. The speed of the front roller should be about 400 revolutions per minute if leather is used, and 350 revolutions per minute if metallic top rolls are used. The drawing should be sized at least twice a day and four times a day is better. The setting of the bottom steel rolls should be especially looked after, as well as the knock-off motions, to see that no single is allowed to pass. If

these motions are not in perfect working order single will be allowed to pass, which will throw your numbers all out and cause a great deal of trouble to remedy. When changing the draft to change weight, always have same size draft gear on machines running the same kind of work. The weight per yard of the sliver is 70 grains per yard. The drawing sliver is drawn into .60 hank roving at the slubber. Watch

THE TRAVERSE MOTION

to see that it is in working condition. After passing the slubber, the roving is passed through two processes of fly frames, the hank at each process being 2 at the first and 6.50 hank at the second for the warp yarn and 8 hank for the filling yarn. Size these yarns once a day and be sure to keep them on the mark. Watch the build of bobbins, traverse motion, rolls and setting of same. The roving for warp yarn is made in 34s on a frame with a 1⅜-inch diameter ring, 6½-inch traverse, 27.70 turns per inch and spindle speed of 10,200 revolutions per minute. The yarn is then spooled, warped and slashed. The filling is spun into 38s on a frame having a 1⅜-inch diameter ring, 5½-inch traverse, 23.12 twist per inch and spindle speed of 8,800 revolutions per minute.

Dyeing Particulars.

PINK.

Four ounces Erika G; 15 pounds Glauber's; 2 pounds sal soda.

LIGHT BLUE.

One-half per cent diamine sky blue F F; 15 per cent Glauber's; 2 per cent sal soda.

MAUVE.

One-half per cent diamine violet N; 15 per cent Glauber's; 2 per cent sal soda.

LIGHT SLATE.

One-quarter per cent diamineral blue R; 1-16 per cent diamine fast yellow B; 10 per cent Glauber's; 2 per cent sal soda.

LIGHT FAWN.

One-quarter per cent diamine catechine G; ⅛ per cent diamineral brown G; 10 per cent Glauber's; 2 per cent sal soda.

SLATE.

One and one-half per cent diamine black B H; ¼ per cent diamine fast yellow B; 20 per cent Glauber's; 2 per cent sal soda.

PEA GREEN.

One-half per cent diamine green G; 10 per cent Glauber's; 2 per cent sal soda.

ECRU.

One-eighth per cent diamine catechine 3 G; ⅛ per cent diamine catechine B; 10 per cent Glauber's; 2 per cent sal soda.

ROYAL BLUE.

Two per cent diamine blue 3 R; 2 per cent diamine brilliant blue G; 20 per cent Glauber's; 2 per cent sal soda.

SEAL BROWN.

Two per cent diamine catechine B; 2 per cent diamine catechine G; 20 per cent Glauber's; 2 per cent sal soda; 1 per cent diamine fast yellow A.

WINE.

Five per cent diamine Bordeaux B; 2 per cent sal soda; 20 per cent Glauber's.

RED.

Four per cent diamine fast red 2 B; 2 per cent sal soda; 15 per cent Glauber's.

NAVY BLUE.

Five per cent diamine black B H; 1 per cent diamine brilliant blue G; 20 per cent Glauber's; 2 per cent sal soda.

BLACK.

Three per cent diamine jet black O O; 3 per cent diamine jet black S S; 30 per cent Glauber's; 2½ per cent sal soda.

BOTTLE GREEN.

Five per cent diamine black H W; 2 per cent sal soda; 20 per cent Glauber's; 2 per cent diamine fast yellow B.

BEIGE.

Under the head of beige is a class of dress goods, the characteristic of which is their mottled or mixed effect. This effect is brought about by various methods. The method used in producing the effect largely influences the quality of the fabric, but the general appearance remains the same.

We will describe beige as made by three different methods: First, this fabric as originally made of yarns spun from wool dyed in the stock; this dyed stock is then mixed with undyed stock, then spun into a thread; generally several mixtures go into one fabric.

These mixtures of dyed and undyed stock are varied. The proportions used may be 50 per cent of each; an-

other mixture may have a more or less percentage of either stock; and another mixture may be composed of still a different percentage from the first two.

The threads then spun from these mixtures are arranged in some order in the warping and also in the weaving, producing what are commonly known as indefinite plaid effects in connection with the mixed or mottled effects.

THE SECOND METHOD

is to use a combination of twist yarns, usually three or four different colored threads, as, for example, black and white, black and slate, slate and white, and the other may be a pearl and white. These combinations of threads may be arranged similar to the arrangement in the first method, likewise producing an indefinite plaid effect. The use of black and white, slate and

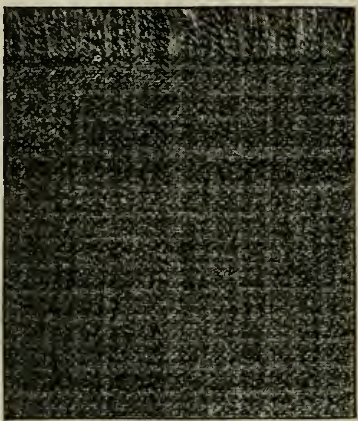


Fig. 1.

white, and colors of similar shades, produces gray effects. Grays and browns are the prevailing colors in this class of goods. The colored yarn used in this particular class is usually worsted, while the white in most cases is a cotton thread.

THE THIRD METHOD

of producing this mixed or mottled effect is brought about by printing the goods.

This method is usually practiced on the cheaper grade of goods, goods composed entirely of cotton yarn; the effect, however, imitates very closely the wool dyed in the stock fabric or the goods composed of twist yarns. In the finer grade of fabrics the twill weave is much in evidence, while the cotton goods are mostly woven plain. The plain weave is more adapted to the particular character of printing; in order to give the plaid effect in connection with the mixed or mottled appearance, the goods are subjected to two processes of printing:

ANALYSIS OF COTTON BEIGE.

Width of warp in reed, 38 inches; width of fabric finished, 36 inches; reed, 1,000 by 2; number of ends in warp, 2,076; 28 ends each selvedge equals 56; total ends in warp, 2,132. Number of ends per inch finished, 60; picks per inch finished, 48; take-up of warp during weaving, 12 per cent; warp and filling yarn 1-26. The 1,000 reed means 1,000 dents in 36 inches of reed. The 2,076 is the number of ends in warp without the selvedge.

Fig. 1. Sample of fabric as produced by means of twist yarns; the fabric is plain woven.

LOOM USED.

For the better grade of fabrics the pick and pick loom is required to give the best effects. The goods woven pick and pick will be less inclined to appear stripy; this effect would be undesirable; the stripes should be of an indefinite nature.

The sample of fabric shown in Fig. 1 is woven on a 4x1 box loom, in which no less than two picks of one color must be woven before it changes on to the next color; unless the colors are carefully graded they will produce a fabric more or less striped. In the printed cotton beige fabric a single box loom fills the requirements. This grade of goods is woven with undyed yarns; the effect, as already mentioned, is produced by the printing machine after the goods are woven.

FINISHING.

The cotton fabric, after it is woven, is boiled off, after which it is slightly stiffened, then subjected to the printing machine, after which it is pressed, then made up into laps or rolls and then shipped.

Carding and Spinning Particulars.

Beige is a dress goods generally made from wool and sometimes of wool and cotton, other grades being made from all-cotton yarns. The cotton is dyed in the stock. Some of the grades of beige are made from combed yarn, whereas other grades are made from carded yarns. The staple of the cotton does not exceed 1⅜ inches in length for an American cotton. Mix cotton as has been previously stated. Three processes of pickers are used,

the particulars being the same as given for etamine. The particulars for the cards and drawing frames as given in that article may be also followed.

AT THE SLUBBER

the drawing sliver is made into .60 hank roving, and is then put through two processes of fly frames or speeders, the hank roving at the first intermediate being 1.75 and at the second intermediate being 5 hank. Speeders should be looked after to see that the rolls are properly set; that top rolls are in good condition; that there are no dead spindles; that the spindles are oiled once a day; the build of bobbin correct; traverse motion working properly, and frame at all times clean and neat. The bobbins when doffed should not be thrown into doffing box or truck, but should be packed in. The boxes or trucks should be cleaned out before doffing. After changing a frame from one kind of work to another the new roving should be sized and tested for twist, and the tension watched. After the speeders the yarn is put through

THE SPINNING FRAME,

where the proper colors of yarns are doubled together and spun into 26s yarn, the warp frame having the following particulars: Length of traverse, 6½ inches; diameter of ring, 1¾ inches; gauge of frame, 2¾inches, and spindle speed of 9,700 revolutions per minute. The yarn is then spooled, warped and slashed. For the filling frame use a 2¾-inch gauge of frame; 1⅝-inch diameter ring; 6-inch traverse and a spindle speed of 8,000 revolutions per minute; the diameter of the front bottom steel roll of spinning frames being one inch for both warp and filling.

Dyeing Particulars—Yarn Dyeing.

NAVY BLUE.

Four per cent naphtamine blue 2 B; 30 per cent Glauber's; 2 per cent sal soda.

MEDIUM BROWN.

Three per cent naphtamine brown N; 1 per cent naphtamine yellow N N; 20 per cent salt; 2 per cent sal soda.

RED.

Four per cent diamine fast red B B; 25 per cent salt; 2 per cent sal soda.

DARK BROWN.

Four per cent naphtamine brown 6 B; 25 per cent salt; 2 per cent sal soda.

SLATE.

One and one-half per cent naphtamine black D; 20 per cent salt; 2 per cent sal soda.

OLIVE.

Three and one-half per cent naphtamine olive R; 20 per cent salt; 2 per cent sal soda.

GREEN.

Six per cent immedial green G G; 6 per cent sulphide soda; 2 per cent soda ash; 25 per cent Glauber's.

DARK BOTTLE GREEN.

Eight per cent immedial green; 8 per cent sulphide soda; 2 per cent soda ash; 25 per cent salt.

ECRU.

One-half per cent diamine catechine G; 20 per cent salt; 2 per cent sal soda.

BLACK.

Ten per cent immedial black N N; 10 per cent sulphide sodium; 3 per cent soda ash; 30 per cent salt.

MAROON.

Six per cent immedial Bordeaux G; 6 per cent suphide sodium; 2 per cent soda ash; 30 per cent salt.

LIGHT BLUE.

Six per cent immedial sky blue F F; 6 per cent sulphide sodium; 2 per cent soda ash; 30 per cent salt.

Printing Particulars.

Cotton beige is also printed on the piece. To get a good imitation of the woven fabric, it has to be printed on both sides of the piece. After printing one side of the fabric and drying, the pieces are rolled up on a roller and the other side of the piece is printed, so that both sides of the piece present the same appearance. The goods are given a soft finish to imitate a piece of dress goods. The colors printed on are made as fast as possible, so that the goods can be washed when required.

The goods are printed, dried and steamed in a Mather and Platt at 212 degrees F., excluding the air as far as possible. Wash in cold water, soap lukewarm, rinse and dry.

BLUE.

Seventy parts immedial indone B N; stir well to a paste with 20 parts caustic soda lye, 77 degrees Tw.; 50 parts glycerine; then add 150 parts reducing paste A. The whole is heated for some time to 140 degrees F. and cooled; stir in 80 parts China clay; 60 parts saturated solution of common salt; 570 parts alkaline gum thickening.

GREEN.

Ninety parts immedial green G G; 300 parts alkaline gum thickening; 40 parts China clay; 30 parts saturated

common salt solution; 150 parts reducing paste A; mix and stir; when cool add 40 parts China clay; 30 parts saturated common salt solution; 320 parts alkaline green thickening.

BLACK

Seventy parts immedial black N L N; 150 parts reducing paste A; heat together to 120 degrees F.; allow to cool down, then stir in a mixture of 160 parts China clay; 120 parts saturated solution of salt; 500 parts alkaline gum thickening.

BROWN.

Mix as the blue with 70 parts immedial brown B; 10 parts immedial yellow D.

DARK SLATE.

Thirty parts immedial black N B; mix as the green.

LIGHT SLATE.

Ten parts immedial black N G; 2 parts immedial direct blue B; mix as the green.

ECRU.

Five parts immedial yellow D; 2 parts immedial cutch G; mix as the green.

OLIVE.

Fifty parts immedial olive B; 20 parts immedial bronze A; mix as the green.

BRONZE.

Forty parts bronze A; 10 parts cutch G; mix as the green.

FAWN.

Fifty parts immedial cutch O; 10 parts immedial brown R R; mix as the green.

LIGHT BLUE.

Forty parts immedial sky blue; mix as the green.

POPLIN.

Poplin is a name given to a class of goods distinguished by a rep, rib, or cord effect running width way of the piece. It referred originally to a fabric having a silk warp and a figure of wool filling heavier than the warp. At the present time it refers more to a ribbed fabric than to one made from any particular combination of materials.

Cotton poplin is usually made with a plain weave, the rep effect being obtained either by using a fine warp as compared with the filling, or a large number of ends as compared with picks per inch, or both.

IRISH POPLIN,

made principally in Dublin, is a fabric made of China organzine silk warp and colonial wool filling. The manufacture of this cloth has continued in Dublin since 1693, when a number of Huguenot silk weavers emigrated from Lyons, France. The industry is still carried on there to some extent on hand looms, the weavers owning their own looms. The materials are supplied by the firms for whom they work and are given out ready for weaving. The Irish poplin is a light-weight variety of poplin, sometimes called single poplin, and is celebrated for its uniformly fine and excellent wearing qualities.

Brocaded poplin is made with elaborate jacquard designs of various types.

TERRY POPLIN

is a very durable fabric, made on the principle of cloth construction explained in the article on "Terry Pile Fabrics." By throwing to the surface alternate ends of the silk warp an appearance somewhat resembling terry velvet is obtained.

The bulk of cotton poplin goods are woven and finished white. Those that are shown in colors, except those of poor quality, are yarn dyed. They are not piece dyed, for the reason that when fine and coarse yarns are combined in the same fabric they do not take the dyes equally.

For a given length of poplin cloth a much greater length of warp is required than for an equal length of cloth where the warp and filling yarns and ends and picks are practically equal, because the coarse filling lies in the cloth in practically a straight line, the warp yarns having to do all the deflecting.

The analysis of a typical cotton poplin of good quality shows the following data: Ends per inch, 104; picks per inch, 48; finished width, 27 inches; weight about 6 yards per pound; warp yarns, 2-68s; filling yarns, 2-60s. Plain weave.

CALCULATIONS.

To find number of yards per pound $2\frac{1}{2}$ yards weigh 2,940 grains.

$$\frac{7{,}000 \text{ (grs. per lb.)} \times 2.5 \text{ (yds.)}}{2{,}940 \text{ (grs.)}} = 5.95, \text{ say } 6 \text{ yds. per pound.}$$

To find average counts of yarn, assuming the warp yarn to have contracted 10 per cent in length from warp to finished cloth, and the filling 4 per cent in width:

104 (ends) divided by .90........................115.55
48 (picks) divided by .96........................ 50.00

165.55

$$\frac{165.55 \times 27.5 \text{ (width)} \times 6 \text{ (weight)}}{840} = 32.5 \text{ aver. counts.}$$

In dealing with the preceding calculations it has been considered that the yarns were mercerized before being woven, and the counts indicated after mercerizing. The mercerizing process tends to contract the length of yarn to a greater or less degree, depending upon the quality of the yarn, the mercerizing liquor, and the machinery used. If mercerized under tension, there is not a very large contraction, but if the yarn is allowed to contract it may do so to the extent of 20 to 30 per cent, that is, a cotton yarn spun to 50s may contract in the mercerizing bath to 40s or 35s yarn.

Both warp and filling in the sample under consideration are mercerized, and are 2-ply yarns of good quality.

To find the counts of filling required to give the stated weight, assuming the warp yarn to be 2-ply 68s:

165.55 divided by 32.5 (ave. counts)..............5.09
115.55 (slay) divided by 34 (warp counts).........3.39

1.70

Fifty divided by 1.70 equals 29.4 equals 2-59s filling required. The counts would be indicated as 2-60s.

The selvedges consist of eight double ends on each side.

To find number of ends in warp:

104 (ends per inch) x 27.5 (cloth width) = 2,860.
2,860 + 16 for selvedge = 2,876, total ends.

To find weight of warp in 100 yards of cloth:

$$\frac{2{,}876 \text{ (ends)} \times 100 \text{ (yards}}{840 \times 34 \text{ (counts)} \times .90 \text{ (10\% contraction)}} = 11.18 \text{ lbs. warp.}$$

To find weight of filling in 100 yards of cloth:

$$\frac{48 \text{ (picks)} \times 27.5 \text{ (cloth width)} \times 100 \text{ (yds.)}}{840 \times 30 \text{ (counts)} \times .96 \text{ (4\% contraction)}} = 5.45 \text{ lbs. filling.}$$

To find weight of 100-yard cut:

11.18 lbs. warp.
5.45 lbs. filling.

16.63 lbs. yarn in 100 yards of cloth

To find number of yards per pound:

100 divided by 16.63 = 6 yards per pound.

LOOM REQUIRED.

For plain weave poplins an ordinary plain cam loom is required, one warp and one filling being sufficient. It is not advisable to use automatic looms unless the same are equipped to change the cop or bobbin before the preceding one has spent itself, because a mispick is one of the defects that shows most prominently in this class of goods.

FINISHING.

The fabric under consideration, having been bleached and mercerized in the yarn, requires very little aftertreatment. It is washed, conditioned, calendered lightly and made up, book fold.

Carding and Spinning Particulars.

When making the yarns for poplin the same particulars may be followed as have been previously given in the article on "Lawn." For this particular grade of poplin the warp yarn is 2-68s and the filling yarn 2-60s. Use the instructions given for making 60s warp yarn, with the following exceptions. The spinning frame for the warp yarn would be as follows: For making 68s warp yarn, 1⅜ inches diameter of ring; 5½ length of traverse, and spindle speed of 10,000 revolutions per minute. This yarn is then spooled and twisted into 2-ply, the twist put in being 39.17 turns per inch. After being twisted, the yarn is warped and slashed. For spinning the 60s filling yarn use a frame having a 1¼ inch diameter ring; 5-inch traverse, 27 twists per inch and a spindle speed of 8,000 revolutions per minute. This yarn is spooled and twisted into 2-60s, after which it is conditioned and is then ready for use.

Dyeing Particulars.

BRONZE.

Five per cent pyrol bronze; 5 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

GREEN.

Six per cent pyrol green G; 6 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

BLUE.

Six per cent pyrol blue B; 6 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

ECRU.

One-half per cent immedial catechine

G; 1 per cent sulphide sodium; 2 per cent soda ash; 10 per cent salt.

OLIVE.

Two per cent immedial indone B; 6 per cent immedial yellow D; ½ per cent immedial catechine G; 9 per cent sulphide sodium; 2 per cent soda ash; 25 per cent salt.

WINE.

Eight per cent diamine Bordeaux B; 2 per cent sal soda; 25 per cent salt.

RED.

Five per cent diamine fast red B B; 2 per cent sal soda; 25 per cent salt.

NAVY BLUE.

Eight per cent katigen indigo B; 8 per cent sulphide sodium; 2 per cent soda ash; 30 per cent salt.

SLATE.

One per cent thion black T B; 2 per cent sulphide sodium; 1 per cent soda ash; 10 per cent salt.

SKY BLUE.

One per cent diamine sky blue F F; 1 per cent sal soda; 10 per cent salt.

SEA GREEN.

One-half per cent immedial green B; 1 per cent sodium sulphide; 2 per cent soda ash; 10 per cent salt.

COTTON-MOHAIR FABRICS.

Mohair fabrics, commonly so called, are used exclusively for dress goods, in the form of tailor-made suits, skirts, children's coats. etc.

The name, mohair, is acquired from the material used in the construction of the fabric. This material, mohair, the product of the Angora goat, is used principally in the filling only; the warp may be cotton, worsted, or silk, according to the quality of fabric wanted.

The characteristics of mohair fabrics are their crispness and glossy appearance. These features are effected by the mohair. Mohair, like wool, is an animal fibre, but differs from the latter in so far that the fibres are longer and coarser than wool, and mohair is not as soft or as crinkled as wool; in brief, it may be described as a long, straight, glossy animal fibre. These fabrics

VARY CONSIDERABLY

in regard to quality, style and width, but all are plain woven fabrics. Some are elaborated into spot patterns by means of the filling floating over a given number of ends in some geometrical form.

Again, the spots may be formed by the use of an extra warp. This warp floats on the back of the fabric for a given space, then comes to the face for a required number of picks. This extra warp is usually mercerized, the yarn differing in color from the body of warp and being arranged in groups of two or more ends across the entire breadth of warp. These groups of threads may alternate, as, for example, one group may be yellow, the next green, another red

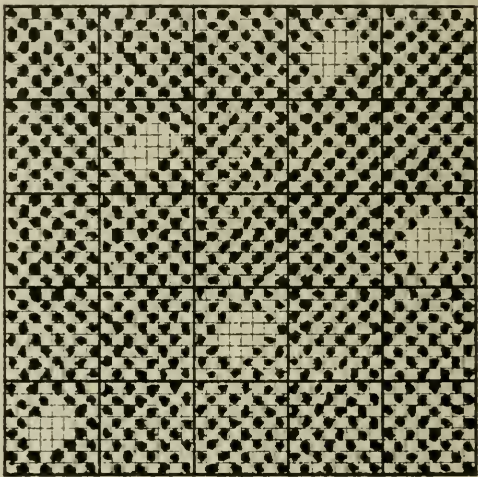


Fig. 1.

or any color that may strike the fancy of the designer, providing that the color thus used produces some degree of harmony. This will give plenty of variety to the fabric, and if these various groups of threads are made to work on some sateen or broken twill order, they will give the appearance of a large design, or, as generally mentioned, a jacquard effect. In filling floated fabrics, it is most important that the distribution of the figure should be so that the eye is not attracted by lines formed by the unequal distribution of the figure. This objectional feature is most likely to occur in designs of this character. It is somewhat difficult to tell if the distribution is perfect without extending the design for four or even more repeats. In designs which consist of set figures, the difficulty of arrangement is somewhat eliminated by ar-

ranging the figure on some irregular sateen basis, the irregular sateen being preferred to the regular sateen basis as the former gives a somewhat stiff appearance, the latter giving a mixed effect more suitable for this class of fabrics. Figure 1 shows one repeat of the design, the spot based on a 5-harness sateen order. Figure 2 shows one repeat of figure based on $\frac{1}{3}$ broken twill. Figure 2 presents a more mixed effect than Fig. 1.

Considerable quantities of mohair are woven plain throughout. In this style of fabrics the ornamentation, if such is desired, is effected by means of twist or fancy colored threads arranged in some order, usually in the warp only, though a similar arrangement may be carried out in regard to the filling. These fancy colored

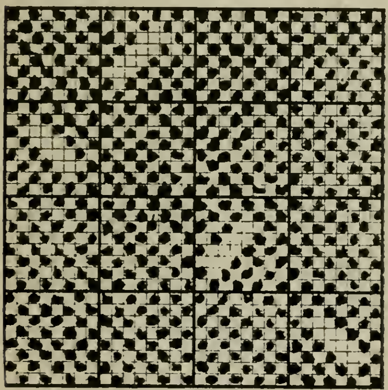


Fig. 2.

threads may be arranged in almost any way possible; the object, however, is to have a fine hair-line stripe throughout the entire length of fabric. Still another method of breaking the monotony of a plain fabric is to skip a dent in the reed at certain intervals; this may be carried out with fancy colored threads if desired. These fabrics, as mentioned above, are made in various qualities. We will here deal with the cotton warp and mohair filling fabric. This particular class is usually piece dyed. The warp, however, is dyed before it is beamed. When twist yarn is used, that is, a twist composed of two different colored threads, one of the two threads in some fabrics is a worsted thread; when such is the fact, the warp is not dyed until woven into the fabric; the cotton end composing one of the twist threads will not take the color in a worsted dye. When cotton only is use in the twist one of the threads is dyed before it is twisted, that is, if a colored and white thread is to be the twist wanted.

ANALYSIS OF COTTON MOHAIR.

Width in reed, 60½ inches; width finished, 54 inches; ends per inch in reed, 44; ends in warp, 2,660; ends in selvedge, 78 (39 each side, 3 in a dent); total ends, 2,738; reed, 44x1.

Dressing 2 ends black
1 end black, white
2 ends black
1 end black, white
2 ends black
1 end black, white
2 ends black
1 end black, white
2 ends black
2 ends black, white
—
16

Ends in warp.

1,664	black cotton	10 2-80
996	black white cotton	6 2-80
78	bleached cotton	0 2-80
2,738		16

Filling 1-15s mohair, 48 picks.

LOOM REQUIRED.

The plain mohair, or the fabric in which the ornamentation is effected by means of fancy colored threads, may be woven on any light-weight loom; the roller, dobby or Northrop loom may be used to advantage. The loom could make better cloth if it had a warp stop-motion, as it is very important that no ends be left out in the weaving; if they are, they must be sewed in before the fabric is finished, thus entailing another expense.

Fancy figured mohair requires the use of a jacquard loom, on account of the number of ends in the repeat of the pattern, which would be too great for the dobby loom.

The warp for mohair fabrics is reeded one end in one dent, and woven with considerable tension on the warp beam.

FINISHING.

After the fabric is woven it is examined and mended if necessary, then scoured, after which it is dyed. These fabrics are dyed in various colors and shades. After the dyeing process, the fabrics are sheared on the face, then doubled and made up into rolls, ready for the market.

Carding and Spinning Particulars.

Mohair is composed of all mohair or a cheaper grade which is made up of mohair and cotton. The count of the

yarn used for the sample under description is composed of 1-15s mohair filling and 2-80s warp yarn. The yarn for the filling is made in cotton mills of either the first or second division as classified in a previous article. The yarn is made from an American cotton, either peeler or Allen seed being used. The staple is 1½ inches, and cotton should be of a good grade. As this cotton is apt to be very dirty, it is generally put through an opener and three processes of picking.

THE MIXING

should be as large as possible, and if possible the mixing should be allowed to stand for at least three days before using so that it may dry out and expand. If this is done it will be found that the cotton is easier to work and the dirt will be taken out very much easier. At the mixing be sure that the grades of the cotton of each bale are the same and do not under any circumstances use a creamy bale. Each bale should be stapled before being put into the mix to see that it is up to staple. Keep the hopper of the opener well filled with cotton so as to obtain as even a feed as possible. The

SPEED OF THE BEATER

at the breaker picker for this stock is 1,450 revolutions per minute, the beater used being of a two-bladed type. The weight of a 40-yard lap at the front of the breaker is 40 pounds or a 16-ounce lap. At the intermediate picker the speed of the beater should be 1,400 revolutions per minute, the lap at the front weighing 37½ pounds or a 12-ounce lap. At the finisher picker the speed of the beater is 1,350 revolutions per minute. The total weight of the lap is 35 pounds or a 12½-ounce lap. At the finisher picker the good waste laps, or, as they are sometimes called, cut roving waste laps, are mixed in with the raw stock, one lap cut waste to three laps of good cotton. In mills that do not have a roving waste picker it is

THE GENERAL CUSTOM

to take out the middle two laps and spread the cut waste evenly in this span and use up the waste in this manner. These laps are sometimes put up at the cards, but the general custom is to put them through the finisher picker again in the proportion named above. A variation of not more than one-half a pound either side of standard is allowed, every lap being weighed. If the laps weigh over or under this allowance they should be run over again. This point cannot be looked into too closely and it will save a lot of trouble in the evenness of the numbers at the fine frames and in the spinning room. The laps from the picker are put up

AT THE CARD,

the speed of the licker-in being 350 revolutions per minute; speed of flats, one complete revolution every 45 minutes (110 flats). The cards should be properly set, ground and stripped at least three times a day. Keep the wire sharp at all times and it is a good plan to grind the flats on a special grinding machine for flats, they being taken off the cards for this purpose. The weight of the sliver at the card is 45 grains per yard. As the sliver is to be combed, the card sliver is put up at the sliver lap machine, where it is doubled 14 into 1 (i. e., for a 8¾-inch width lap). The weight of a yard of lap at the front is 290 grains. These laps are put up at the ribbon lap machine and doubled six into 1, the weight of a yard of lap at this machine being 275 grains. These laps are put up at the comber and doubled according to the number of heads that the comber has. The percentage of waste taken out at this machine is 18 per cent. The weight of the sliver is 35 grains per yard. This sliver is put through two processes of

DRAWING FRAMES,

the doubling at each process generally being 6 into 1, although some mills double 8 into 1 at the breaker and 6 into 1 at the finisher. The weight of the sliver at the front of the finisher drawing should be 70 grains per yard. Either metallic or leather top rolls may be used for this class of work, generally the latter being used. See that the leather top rolls on all machines are in perfect shape and well varnished; size the ribbon laps at least once a day and drawing frames four times a day. The drawing sliver is put up at the slubber and drawn into .55 hank roving, after which it is put through three processes of fly frames, the hank roving made at each process being as follows: First intermediate, 1.50, 2d, 4.50 and fine frame, 16 hank. This yarn is taken to the spinning frame and spun into 80s on a frame with a 2¾-inch gauge of frame, 1⅜-inch diameter ring, 5½-inch traverse and spindle speed of 9,600 revolutions per minute. This yarn is then spooled and then twisted into 2-ply 80s yarn, many times two differ-

ent colored yarns being twisted together. The yarn is then respooled and run upon a beam, after which the beams are put through the slasher and sized.

—

Dyeing Particulars.

MEDIUM BROWN.

Three per cent naphtamine brown N; 1 per cent naphtamine yellow N N; 20 per cent salt; 2 per cent sal soda.

DARK BROWN.

Four per cent naphtamine brown 6 B; 25 per cent salt; 2 per cent sal soda.

SLATE.

One and one-half per cent naphtamine black D; 20 per cent salt; 2 per cent sal soda.

OLIVE.

Three and one-half per cent naphtamine olive R; 20 per cent salt; 2 per cent sal soda.

DARK BOTTLE GREEN.

Eight per cent immedial green; 8 per cent sulphide soda; 2 per cent soda ash; 25 per cent salt.

BLACK.

Ten per cent immedial black N N; 10 per cent sulphide sodium; 3 per cent soda ash; 30 per cent salt.

MAROON.

Six per cent immedial Bordeaux G; 6 per cent sulphide sodium; 2 per cent soda ash; 30 per cent salt.

HERRINGBONE STRIPES.

Herringbone stripes are certain weave effects resembling herring bones. They are developed to the greatest extent in men's wear fabrics, woolens, worsteds, cotton worsteds and all-cottons, although in these goods the arrangements of various colors in the warp yarns form one of the principal component parts of the pattern. Herringbone weaves in ladies' dress goods are usually shown in white.

These weaves are a development of ordinary twill weaves in which the twills, instead of running in one unbroken line diagonally across the piece, run for a certain number of ends one way and a certain number of ends in the reverse direction, thus breaking the continuity of the twill. They differ from wave effects in having the two ends defining the turning points of the twill arranged to work opposite each other, i. e., when one is raised the other is depressed. This may be seen at the points indicated by the daggers in Figs. 1 to 5.

The foundation twills principally used when developing these weaves for men's wear goods are the even flushed twills $\frac{2}{\ \ 2}$ and $\frac{3}{\ \ 3}$, Figs. 6 and 7, the former forming the greater proportion. Figs. 1 to 5 show some of the other weaves used, the number of ends in each section and the number of sections in a repeat being made to vary according to rquirements. The daggers indicate the cutting points.

Although the principle may be extended to large weaves, it is seldom that the effects are made from a weave base greater than eight ends and eight picks.

Fig. 8 illustrates a herringbone effect in a cotton cloth made with weave Fig. 1. In the gray the warp appears to stand up from the cloth in the sections weaving $\frac{3}{\ \ 1}$ on the face. This prominent effect is modified in the finished cloth.

Fig. 8 is one of a line or range of patterns made and finished in England, for sale in northwest Africa. The construction of the cloth is as follows: width in gray, 30½ inches; ends per inch, 68; picks per inch, 72; warp, 35s; filling, 48s; yards per pound, 7.72, say 7¾. The ends have been reeded equally throughout, 2 ends per dent. The selvedges consist of 12 ends of 2-ply 30s yarn on each side.

CALCULATIONS.

To find number of ends in warp:

68 (ends per inch) x 30½ (inches) = 2,074 ends.
2,074 + 24 (selvedges) = 2,098 ends in warp.
24 2-ply yarns represent 48 single yarns.

In the above calculation 24 of these were considered when multiplying the ends per inch by the width, leaving but 24 to be added.

To find weight of warp:

$$\frac{2098 \text{ (ends) x } 105 \text{ (yds.)}}{840 \text{ x } 35} = 7.05 \text{ lbs. warp.}$$

To find weight of filling:

$$\frac{72 \text{ (pks.) x } 33 \text{ in. (width in reed) x } 100 \text{ (yds.)}}{840 \text{ x } 48} = 5.89 \text{ lbs. filling.}$$

To find number of yards per pound:

7.05 lbs. warp.
5.89 lbs. filling.

12.94 lbs. weight of cut.

100 (yds.) divided by 12.94 = 7.72 yards per pound.

The finished fabric has been heavily sized or filled, giving but 6 2-3 yards per pound.

LOOM REQUIRED.

The class of goods under consideration is generally woven on fast running, side cam, single box looms. One warp only is required and the goods are reeded equally throughout.

Fig. 1.

Fig. 2.

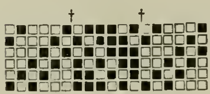


Fig. 3.

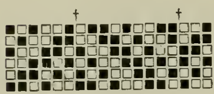


Fig. 4.

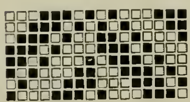


Fig. 5.

Fig. 6.

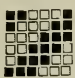


Fig. 7.

FINISHING.

This fabric has been subjected to the "back filled" process of finishing. This consists of bleaching, mangling, drying, damping, calendering, stretching and filling. The mixture for back filling is composed of wheat starch, farina, China clay, oleine oil, cocoanut oil, bluing, carbolic acid and water. After being filled, it is dried, dampened, calendered and made up as required.

Carding and Spinning Particulars.

The yarns of which herringbone stripes are composed are made in mills of the second division, as given in a previous article. The count of the yarns put into this style of fabric varies, and for this article we will consider that the count of the yarn used is 35s for warp yarn, 48s for filling and 30s for the selvedge. The staple of the cotton used for the 30s and 35s yarn is 1¼ inch and for the 48s is 1 3-16 inch of a middling grade.

THE MIXINGS

should be as large as possible so that as little variation as possible will be found between the different mixings, and also there should be two mixings of the same length of staple, one being used while the other is being worked. If the mixing is put through a bale breaker one mixing may be done away with. This is so that the cotton will be allowed to expand as much as possible before being put through the pickers. An opener and

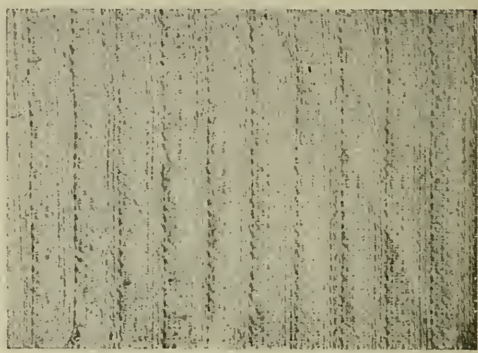


Fig. 8.

THREE PROCESSES OF PICKERS

are generally used for both lengths of staple. Follow the rules already given in connection with the openers. At the breaker picker the speed of a two-bladed rigid type of beater is 1,500 revolutions per minute and of a three-bladed beater is 1,000 revolutions per minute. If a pin beater is used the speed is 1,200 revolutions per minute. The total weight of the lap at the front of this picker is 40 pounds. The laps are put up at the intermediate picker and doubled 4 into 1. The speed of a two-bladed beater at this machine is 1,450 revolutions per minute, a three-bladed beater, 950 and a pin beater, 1,100 revolutions per minute. The total weight of a lap at the front of this machine is 38 pounds or a 14 ounce lap for both stocks. These

laps are put up at the breaker picker and doubled 4 into 1. At this picker the cut waste laps are put in in the proportion of three laps of raw stock to one lap of cut waste, the waste lap being generally inserted between the back and third lap. The speed of this beater is 1,400 revolutions per minute; for two-bladed beater, 925 revolutions per minute; and 1,050 revolutions per minute for a pin beater. The total weight of the lap at the front is 39 pounds or a 16-ounce lap for a 40-yard (in length) lap. The laps are next put up

AT THE CARD.

This card should have a licker-in speed of 350 revolutions per minute. The wire used should be 110s for cylinder and 120s for doffer and top flats. The top flats should make one complete revolution every 45 minutes and should be looked after to see that they are properly cleaned and ground. Grind and strip and set as per instructions given in a previous article on the same length of staple. The weight of the sliver at the front should be 45 grains per yard and the production 650 pounds per week of 60 hours. The cottons are next put through the sliver lap machine, the doublings being 14 into 1 and the weight per yard of lap being 290 grains per yard. These laps are put up at the ribbon lap machine and doubled 6 into 1, the weight per yard of lap being 275 grains.

AT THE COMBER

the laps are doubled 6 into 1 and the weight per yard of the sliver is 40 grains per yard. For this class of goods 16 per cent of waste is taken out. Keep the leather top rolls in good condition and well varnished and the comber free from dirt. At the drawing frames the doublings at the breaker are 8 into 1 and at the finisher, 6 into 1. This is not the case in all mills, as the number of doublings used varies. The weight per yard at the finisher drawing is 70 grains. This is put through the slubber and made into .60 hank roving. The slubber roving for the 30s and 35s yarn is made into 2 hank roving at the intermediate fly frame and 6.50 at the fine frame. The hank roving for the 48s is 2.50 at the intermediate and 9.50 at the fine frame.

THE SIZING

of the cotton should be as follows: At pickers, every lap and a variation of not more than one-half a pound from standard weight allowed; at the card once a week; at sliver and ribbon lap once a day; at drawing frame four times a day; at slubber once a week, at intermediate once a week; and at fine frame once a day.

The roving for 30s selvedge yarn is made on a frame having a 6½-inch traverse, 1¾-inch diameter of ring, 26.02 twist per inch and a spindle speed of 9,800 revolutions per minute; for the 35s the same conditions exist except that a 1⅝-inch diameter ring is used, a 28.10 twist per inch and a spindle speed of 10,300 revolutions per minute. The yarn is then spooled and warped and put through a slasher. The filling yarn may be either mule or ring spun; if the latter, use a frame having a 1¼-inch diameter ring, 5½-inch traverse, 25.98 twist per inch and a spindle speed of 8,400 revolutions per minute. This yarn is then conditioned, after which it is ready for the loom.

Dyeing Particulars.

BRONZE.

Five per cent pyrol bronze; 5 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

GREEN.

Six per cent pyrol green G; 6 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

BLUE.

Six per cent pyrol blue B; 6 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

OLIVE.

Two per cent immedial indone B; 6 per cent immedial yellow D; ½ per cent immedial catechine G; 9 per cent sulphide sodium; 2 per cent soda ash; 25 per cent salt.

WINE.

Eight per cent diamine Bordeaux B; 2 per cent sal soda; 25 per cent salt.

RED.

Five per cent diamine fast red B B; 2 per cent sal soda; 25 per cent salt.

NAVY BLUE.

Eight per cent katigen indigo B; 8 per cent sulphide sodium; 2 per cent soda ash; 30 per cent salt.

SLATE.

One per cent thion black T B; 2 per cent sulphide sodium; 1 per cent soda ash; 10 per cent salt.

SKY BLUE.

One per cent diamine sky blue F F; 1 per cent sal soda; 10 per cent salt.

SEA GREEN.

One-half per cent immedial green B; 1 per cent sodium sulphide; 2 per cent soda ash; 10 per cent salt.

UNION LINEN LAWNS.

These fabrics, as the name implies, are made up of cotton and linen yarns. The cotton in most cases forms the warp and the linen is woven in as filling.

Union linen lawns are plain woven fabrics made in various textures in regard to ends and picks per inch, and also the quality and counts of yarn.

The goods are used for various purposes, principal among which are furniture coverings, summer outing suits and dusters. The goods, when used for the above purposes, are usually finished without bleaching. The cotton yarn is usually dyed to match the color of the unfinished linen warp or filling. as the case may be.

The fabric as used for household purposes is usually finished white or bleached.

CLASSIFICATION AND ORIGIN.

Woven fabrics may be divided into three classes, generally speaking, and from these there are derived all the various weaves now in use, with the possible exception of the leno weave, which may be placed in a class separate from the three foundation weaves, to wit, the plain weave or cotton weave, second, the twill weave, and third, the satin weave. The first-named in the division covers a greater variety of fabrics than the combined number of the latter two, the weave in connection with the kind and quality of yarn and also the texture. Notwithstanding that there may be several textures in any particular fabric, these are the distinguishing features that characterize the wide range of cotton fabrics.

The origin of the name is derived sometimes from the city or country in which the fabric was first made, or from the name of the maker; or, again, it may be given to the fabric from the nature of the material of which it is made, as, for example, union linen lawns; the name lawn implies that the fabric is plain woven.

In

THE CONSTRUCTION

of these fabrics there is considerable latitude in regard to ends and picks per inch and counts of yarn. Some grades of linen lawns are made up very firmly, again others may be constructed rather loosely.

ANALYSIS.

Width of warp in reed, 38 inches; width of fabric, finished, 36 inches; ends per inch, finished, 60; ends in warp, 2,160; ends in selvedges, 20; total, 2,180.

Reed, 27½x2; take-up of warp during weaving about 8 per cent; warp, 1-40s cotton.

Filling, 1-20s linen, 300 yards per hank; 56 picks.

Analysis of a coarser grade of union linen lawn: width of warp in reed, 37½ inches; width of fabric, finished, 36 inches; ends per inch, finished, 52; ends in warp, 1,872; ends in selvedges, 16; total, 1,888.

Reed, 25x2; warp, 1-30s cotton.

Filling, 80s linen, 300 yards per hank; 50 picks per inch; take-up during weaving, 10 per cent.

Fig. 1. weave.

Fig. 2 drawing-in draft.

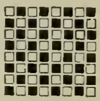


Fig. 1.

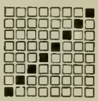


Fig. 2.

WEAVING AND FINISHING.

Fabrics used for dress goods, that is, outer garments, require more attention in the weaving than almost any other class of fabrics. The goods should be woven faultlessly, or, if the fabric has any faults, these faults must be mended so as not to show in the finished fabric; otherwise the goods can only be sold as seconds and at a greatly reduced price; consequently, a weaver has charge of but four looms on plain woven fabrics, intended for dress material. The looms used for these goods may be plain cam looms, roller looms, or clipper looms, running at from 120 to 140 picks per minute. The goods, after they come from the loom, are burled and mended, then boiled off if finished without bleaching, or they may be bleached, then pressed, made up into laps and are then ready for shipment.

Carding and Spinning Particulars.

Union linen lawn is composed of two fibres, linen and cotton, the warp yarn being cotton and the filling yarn linen. Several grades of this fabric are made, two of which are taken for example. In these two the warp yarn is 1-40s for

the fine and 1-30s for the coarser fabric. These yarns are made in the same division of mills and, in fact, the same mills make the two classes of fabric. Where this is the case,

THE DIFFERENT PROCESSES

weights per yard, etc., are the same up to a certain point. We will consider the two counts to be made of the same staple and grade of cotton, which would be 1 5-16-inch staple peeler cotton. The bales should be opened, stapled and graded before being put into the mixing, which may be done either by hand or by machine,that done by the bale breaker being better because it opens the cotton more thoroughly. The good sliver from the machines up to the slubber is mixed in at this point either as it is collected, or, as is often done, on mixing days. The cotton is put through three processes of picking and an opener.

AT THE OPENER

the general instructions given in previous articles should be followed. At the breaker picker the type of beater used may be either a pin or 3-bladed rigid type. The speed of the pin beater is 1,200 revolutions per minute and of the three-bladed type 1,000 revolutions per minute. The weight of the lap at the front of this machine is 40 pounds or a 16-ounce lap. At the intermediate picker the speed of a three-bladed beater is 975 revolutions per minute, the doublings being 4 into 1. The total weight of lap at the front of this machine is 37½ pounds or 15 ounces per yard. At the finisher picker the doubling is 5 into 1. The speed of a two-bladed rigid type of beater is 1,425 revolutions per minute. The total weight of a 40-yard lap is 33 pounds or a 13-ounce lap. At this machine the cut roving waste laps are mixed in the proportion of three laps of good cotton to one lap of cut waste. It is

GENERALLY THE CUSTOM

to prepare these laps at the intermediate picker. At the card the draft should not exceed 100 and the speed of the licker-in is 350 revolutions per minute. The wire fillet used should be that used for medium counts of yarn, or No. 110s for cylinders and No. 120s for doffer and top flats. The speed of the top flats (110 to set) should be one complete revolution every 50 minutes. The weight of the end sliver at the front should be 45 grains per yard and the production 650 pounds per week of 60 hours. Strip cards three times a day and grind once every three weeks. After grinding, set all important parts. Clean out fly at regular intervals for this class of work, it being done twice a day. Watch the strips from the top flats to see how the flats are working. Always have plenty of

SPARE BANDS

on hand so that if one breaks, another may be put on without loss of time. Always see that the brackets used for the stripping brush are properly set for both doffer and cylinder and also see that they are properly stripped by the card attendants, for too often are they only half stripped if they are not watched. The yarn used for this class of goods is combed and at the sliver lap the weight per yard is 290 grains, the doublings being 14 into one. At the ribbon lap the doublings are 6 into 1 and the weight of a yard of lap is 270 grains per yard.

AT THE COMBER

the doublings are 6 into 1 and 16 per cent of waste is taken out. The weight of the sliver at the coiler is 50 grains per yard. Follow the particulars for setting, timing and varnishing the rolls as given in a previous article. The doublings at the breaker are 8 into 1, two processes of drawing being used. The weight per yard at the breaker drawing is 90 grains per yard. At the finisher drawing the doubling is 6 into 1 and the weight per yard is 70 grains. At the slubber the drawing sliver is made into .60 hank roving. The yarn is next put through two processes of speeders or fly frames. At the first intermediate the hank roving is 2 and at the second or finishing speeder the hank roving is 6 for 30s yarn, and 8 hank for 40s yarn. The ròving is next taken to

THE SPINNING ROOM

and spun into 30s on a frame having a 6½-inch traverse, 1¾-inch diameter ring, 26.02 twist per inch and a spindle speed of 9,800 revolutions per minute. For spinning 40s, a frame with a spindle speed of 10,000 revolutions per minute, 28.46 twist per inch; 1⅜-inch diameter ring and 6½-inch traverse, is used. After being spun, the yarn is spooled and then run on a beam. Several of these beams are put up at the back of the slasher and after being slashed are run on a beam at the front.

Dyeing Particulars.

OLIVE.

Five per cent pyrol olive G; 5 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

BRONZE.

Five per cent pyrol bronze G; 5 per

cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

BLACK.

Ten per cent thiogene black M conc.; 10 per cent sulphide sodium; 2 per cent soda ash; 25 per cent salt.

SLATE.

One per cent thion black T B C; 1 per cent sulphide sodium; 1 per cent soda ash; 10 per cent salt.

ECRU.

Three-quarters per cent thion brown G; 1 per cent sulphide sodium; 1 per cent soda ash; 10 per cent salt.

RED.

Six per cent diamine fast red B B; 2 per cent sal soda; 25 per cent Glauber's.

BROWN.

Five per cent immedial brown B; 5 per cent immedial cutch O; 10 per cent sulphide sodium; 3 per cent soda ash; 30 per cent salt.

SKY BLUE.

One and one-half per cent thion blue B conc.; 1½ per cent sulphide sodium; 1 per cent soda ash; 20 per cent salt. Develop with peroxide of hydrogen.

NAVY BLUE.

Eight per cent thion navy blue R; 8 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt. Develop with peroxide of sodium.

SATIN CHECKS.

Satin checks, so-called, derive their name from the appearance of the pattern, which consists of variable block effects, usually equal in size in the same piece, on the plain weave basis.

Some of the larger effects resemble checkerboards and are known as such. They are also known as dice checks.

A satin check fabric made in England for the northwestern Africa export trade is similar in construction and finish to the "herringbone" fabric, considered in a preceding article and the data given there in connection with these items will also apply here.

The weave principle upon which the cloth has been constructed may be seen in Fig. 1, which is composed of warp flush and filling flush weaves arranged on the plain cloth base, four square sections completing the weave. In this case the complete weave is on 48x48, each section being on 24x24. The base weaves used are the $\frac{1}{5}$ and the $\frac{5}{1}$ twills.

The object in alternating blocks of warp flush weaves with blocks of filling flush weaves is to produce a cloth whereon the pattern seems to appear stronger when viewed in certain directions than when viewed in others, with two weaves that have the same structure, although differing in appearance. This principle is developed on an extended scale in white damask tablecloths.

The shadow effect seen in these

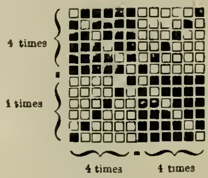


Fig. 1.

Fig. 2.

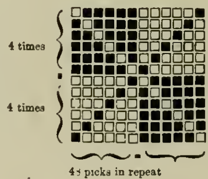


Fig. 3.

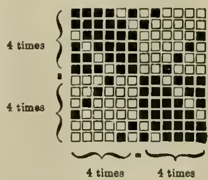


Fig. 4.

goods is an optical illusion, due to the reflection of the light after it falls on the filling being at a different angle to that reflected from the warp, both being viewed from the same position. The larger the section and the greater the proportion of one yarn as compared to the other in the same, the more lustrous will be the general appearance of the goods.

Fig. 2 shows the harness draft and Fig. 3 the chain draft for producing

the weave. Fig. 2 is known as a sectional drawing-in draft.

One of the principal points to be noted in the construction of these weaves is to make the warp floats of each section oppose the filling floats of the adjoining sections, both warp way and filling way. If this is not done, a ragged or indistinct pattern will result, in addition to the cloth not having as firm a feel.

Another point is that it is advisa-

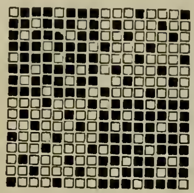


Fig. 5.

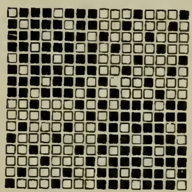


Fig. 6.

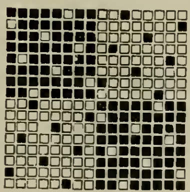


Fig. 7.

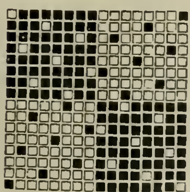


Fig. 8

ble to arrange the base weaves in such positions that although there are four sections in each repeat of the weave, the two filling flush sections will be exactly alike and the two warp sections alike, whenever possible.

This may perhaps be better understood by reference to Figs. 1 and 4. Fig. 4, although composed of the same base weaves as Fig. 1, would not make as clean and even an appearance in the cloth as the latter.

A satin check made with Fig. 5 would be preferable to one made with Fig. 6, other conditions being equal. Both of these weaves are built up from broken crow weave bases and cut on all sides.

Weave Fig. 7 would be preferable to weave Fig. 8. Both are made from the same 8-end satin weave bases, started in different relative positions.

LOOM REQUIRED.

Being woven white and with one count of filling only, a single box dobby loom is generally used when weaving these goods. The two base weaves, one warp flush and the other filling flush, are seldom made on more than 8 ends and 8 picks each, therefore a 16-harness dobby, with a selvedge motion extra, is large enough to allow ample scope for producing a variety of patterns. An 18 or 20 harness dobby should be used if there is no selvedge motion on the loom.

Carding and Spinning Particulars.

As the fabric considered is similar in construction and finish to that described under "Herringbone Stripes," the carding and spinning data need not be repeated.

Dyeing Particulars.

BRONZE.

Five per cent pyrol bronze; 5 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

GREEN.

Six per cent pyrol green G; 6 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

BLUE.

Six per cent pyrol blue B; 6 per cent sulphide sodium; 2 per cent soda ash; 20 per cent salt.

OLIVE.

Two per cent immedial indone B; 6 per cent immedial yellow D; ½ per cent immedial catechine G; 9 per cent sulphide sodium; 2 per cent soda ash; 25 per cent salt.

WINE.

Eight per cent diamine Bordeaux B; 2 per cent sal soda; 25 per cent salt.

RED.

Five per cent diamine fast red B B; 2 per cent sal soda; 25 per cent salt.

NAVY BLUE.

Eight per cent katigen indigo B; 8 per cent sulphide sodium; 2 per cent soda ash; 30 per cent salt.

SLATE.

One per cent thion black T B; 2 per

cent sulphide sodium; 1 per cent soda ash; 10 per cent salt.

SKY BLUE.

One per cent diamine sky blue F F; 1 per cent sal soda; 10 per cent salt.

SEA GREEN.

One-half per cent immedial green B; 1 per cent sodium sulphide; 2 per cent soda ash; 10 per cent salt.

NANKEEN, or NANKIN.

Nankeen, or nankin, pronounced nan-kēn, is a name given to a class of fabrics woven with the plain weave, the distinguishing effect of which is their peculiar yellowish brown color. This color is natural to the cotton of which they are made, the religiosum variety of the gossypium herbaceum class.

The goods are worn by Chinese people in all parts of the world.

The original nankeen fabric derived its name from Nanking, the ancient Chinese city, now known as the "southern capital," being first constructed there from a native cotton. The

PURE NANKEEN FABRIC

is finished and worn in the natural color and is of Chinese manufacture. The raw cotton is rough, short and hard to work, so much so that the supply of cotton of this type and color grown is not enough to supply the demand for the woven goods. For the last half century or more large quantities of so-called nankeen fabrics of British manufacture have been, and are being today, exported to China, the principal market for the same being at Canton. These goods are woven white and subsequently dyed the required color, dyers being able to imitate the qualities of the original nankeen color in all respects.

KINO,

pronounced ke-no, was one of the drugs formerly used for giving the nankeen color. Its chief component part is tannic acid.

Nankeen fabrics, deriving their name more particularly from their peculiar color, are made to vary to some extent in counts of yarns and constructions of cloth, although being kept to medium counts and weights.

A characteristic fabric is made as follows: Counts of warp, 26s; counts of filling, 22s; ends per inch, 68; picks per inch, 64; width, 27 inches finished.

At the present time nankeen fabrics are not necessarily those made exclusively of cotton. A sample under consideration is made from silk scrapings or waste and cotton warp, mixed before going through the preparing machines, and silk waste filling. The mixed fibres in the warp appear later in the same yarn, the yarn being single spun. The fabric is very uneven, more so in the filling than in the warp, but quite uneven in both.

LOOM REQUIRED.

Like other plain cloths, a light, quick running plain cam loom is used for their production. Woven a solid color, one warp and one shuttle only are required. The ends are reeded two in a dent throughout.

FINISHING.

Very little finishing is required for the pure goods. After being burled and brushed they are sheared or singed, or both, crabbed, washed dried, and made up as required.

Imitation nankeens in addition to the above are subjected to the process of dyeing.

Carding and Spinning Particulars.

For carding and spinning particulars, see article on "Tartan Plaids," the counts of yarns for nankeen being similar to those explained in said article.

Dyeing Particulars.

This class of goods is dyed on the gigger dyeing machine in the open width. The method of dyeing is to take the thoroughly boiled and wet out goods and roll smoothly on the first roll of the gigger. Sew the leaders on with smooth, flat seams, then fill the machine with water about six inches above the inside rolls; heat to the required temperature and add ¼ to ½ of the dissolved dye (for light shades it is best to add the color in four portions; for medium or dark shades, the dye may be added in two portions). Then start the machine and pass the cloth through the liquor on to the opposite roll, add more of the dye and return; repeat until shade desired is produced.

A fine nankeen shade may be dyed with the following dyes:

No. 1. Dye with 3 per cent extract fustic; 3 per cent alum. Boil together and add to dye bath in four portions, dyeing at 120 degrees F.

No. 2. Dye with 1-10 per cent diam fast yellow B; 0.08 per cent diam catechine G; 0.015 per cent diam catechine B: 1 per cent soda; 2 per cent soap. Start dyeing at 100 degrees F., heating

slowly to 180 degrees F., then add 5 per cent Glauber's salts in two portions and run to shade.

No. 3. Dye with 2 per cent immedial orange C; 1 per cent katigen brown G G; 3 per cent sodium sulphide; 2 per cent Turkey red oil. Start dyeing at 100 degrees F., heat to 180 degrees F. slowly, and run to shade.

MUSLIN---Foundation Muslin.

Foundation muslin is a fabric used to impart stiffness to parts of garments, principally light-weight dresses of lawn or goods of similar character used for graduation and other purposes. It is loosely woven and of very light weight. The requisite body is imparted to it in the finishing process by one or more stiffening ingredients.

The cloth is woven plain. The ends are drawn single through the heddles and reeded two in each dent, with the possible exception of the selvedge ends.

The analysis of a characteristic foundation muslin shows the following data: Ends per inch, 72; picks per inch, 68; counts of warp, 110; counts of filling, 120; finished width, 31½ inches; weight, 20 yards per pound. The selvedges consist of 12 ends of 60s yarn on each side, reeded 3 ends per dent. The counts of yarns here stated are as found in the finished cloth. All the yarns are somewhat hard twisted and are free from loose fibres.

CALCULATIONS.

31½ inches times 36 equals 1,134 dents occupied by the warp; 1,134 minus 8 for selvedges equals 1,126 dents; 1,126 times 2 equals 2,252 ends of 110s warp; 8 times 3 equals 24 ends of 60s warp; 2,276, total ends.

To find weight of warp in 100 yards of cloth, assuming 10 per cent contraction in length from warp to cloth of the fine yarn and 5 per cent contraction of the coarse yarn:

$$\frac{2{,}252 \times 110 \text{ (length)}}{110 \text{ (counts)} \times 840} = 2.681 \text{ pounds of 110s warp.}$$

$$\frac{24 \times 105}{60 \times 840} = .05 \text{ pound of 60s warp.}$$

2.681 pounds 110s.
.05 pound 60s.

2.731 pounds, total weight of warp.

The 60s warp has been considered as having been run from spools, separate from the main warp.

To find weight of filling in 100 yards of cloth:

72 (sley) — 1 = 71.
71 divided by 2.1 (constant) = 33.82 dents per inch in reed.
1,134 divided by 33.82 = 33.53 in., width in reed.

$$\frac{68 \text{ (picks)} \times 33.53 \times 100 \text{ (length)}}{120 \text{ (counts)} \times 840} = 2.261 \text{ lbs. filling.}$$

In the preceding calculation the gray and finished widths of the cloth have been assumed to be equal, the cloth having been stretched but little, and tentered to the full width, in the process of finishing. The finished width of most fabrics is less than the loom or gray cloth width, requiring that the difference between them be taken into consideration when ascertaining the amount of filling required.

To find number of yards per pound:

2.731 pounds warp.
2.261 pounds filling.

4.992 pounds, total weight.
100 divided by 4.992 = say, 20 yards per pound.

LOOM REQUIRED.

A light, fast running, single box cam loom is preferable for these goods, the ends being drawn through twine harnesses on account of the large number of ends and picks per inch and fine yarn. Being a very light sheer fabric, considerable care has to be taken with it in weaving to prevent misweaves of all kinds, particularly thick and thin places, and broken ends and picks.

FINISHING.

This process is really the one which makes the characteristic qualities of foundation muslin as distinct from other plain woven goods. A fabric of the construction mentioned, being similar in all respects except in the finish, would not be known by the same name if finished differently. In fact, many of the cotton fabrics derive their name from the finishing process to which they have been subjected, irrespective of the construction of the cloths. The purpose for which it is to be used determines, to a more or less degree, the construction and quality of plain woven cloths.

Foundation muslins are usually woven in natural color, after which they are bleached and finished white, somewhat as follows: Burl, singe, bleach, size with gum or gum "tragasol," condition, calender and make up.

When required in colors, the goods are dyed in the piece.

Dyeing Particulars.

BLACK.

Eight per cent union black S; 1 per cent diamine fast yellow A; 30 per

cent Glauber's; 2 per cent sal soda; 2 per cent soap. Top with alizarine black 4 B.

SEA GREEN.

One-half per cent diamine black H W; 4 ounces diamine fast yellow B; topped with new methylene blue N, new phosphine G.

For 10 gallons dye liquor: 6 ounces soap; ½ ounce sal soda; 3 ounces phosphate soda.

NAVY BLUE.

Three per cent diamine dark blue B; 1 per cent diamine brilliant blue G; topped with new methylene blue N X; metaphenylene blue B; indigo blue N.

PEARL.

Two ounces diamine gray G; 1-16 ounce diamine brown M; topped with aniline gray B.

SLATE.

Ten ounces diamine gray G; ⅛ ounce diamine brown M; topped with cyanol extra; orange extra.

LIGHT MAUVE.

One ounce diamine violet N; ½ ounce diamine brilliant blue G; topped with methyl violet B I.

VIOLET.

One per cent diamine violet N; ½ per cent diamine brilliant blue G; topped with methyl violet B I.

PINK.

Two per cent diamine rose B D; topped with rhodamine G.

SKY BLUE.

Four ounces diamine sky blue F F; topped with cyanol extra.

LIGHT BROWN.

One per cent diamine brown B; ½ per cent diamine yellow B; topped with Bismarck brown F F; thioflavine T.

MYRTLE GREEN.

Two per cent diamine black H W; 2 per cent diamine green B; 1 per cent diamine fast yellow B; topped with brilliant green; new methylene blue N.

CREAM.

One-quarter ounce diamine gold; ¼ ounce diamine orange B; 1-16 ounce diamine fast yellow B.

STEEL.

One-eighth ounce diamine gray G; topped with cyanol extra; aniline gray B.

SILENCE CLOTH--Filling Backed

Silence cloth, or table felting, is a heavy cotton fabric used to cover the table, under the linen cloth, for the purpose of preventing damage to the finish of the table and to make the cloth look whiter.

Standard widths of these goods are 54 and 64 inches.

In order to make heavy, thick, firm fabrics it becomes necessary to depart from single cloth structures and interlace the yarns on one or other of the compound weave principles, such as backed, double or heavier ply cloths. In these fabrics some of the yarns, while forming part of the structure, may appear only in the centre or the back, not showing on the face.

THE SIMPLEST FORM

of these is either a warp-backed or filling-backed fabric, the former of which was shown in the article on "Cotton Cassimeres."

Filling-backed fabrics, especially those of the reversible type, i. e., those

Fig. 1.

with the face and back similar, that are made with filling flush weaves, are excellently adapted for making silence cloths, because a heavy nap is required on both sides of the fabric and this can be obtained best by using soft yarn. The nap is obtained principally with the filling yarns, which are soft and coarse, as warp yarn must have considerably more twist than is required for filling in order that it may withstand the wear and tear of the movements caused by the heddles and reed during weaving.

Fig. 1 shows a weave for a filling-backed fabric with a $\frac{1}{3}$ twill on each side. Marks ⊠ represent the face weave; solid type represents the back weave.

A cloth woven with this design would show the warp on both sides, when in the gray, but only one-half of the filling on each side.

The individualities of the yarns are lost in the finishing process; in silence cloths, therefore, such a cloth, if woven with Fig. 1, picked one pick white and one pick color, would have a white sur-

face on one side and a colored one on the other. As the loose fibres of the filling would practically cover the warp, the color of the latter would be of little consequence. On the score of economy it would be best to have it white.

THE ANALYSIS

of a silence cloth, before finishing, shows it to have been constructed as follows: Ends per inch, 68; picks per inch, 40 (20 on the face and 20 on the back); warp counts, 11.6, probably intended for 11.5; filling counts, 2⅞; width, 58 inches; weight, 1.45 pounds per yard; weave, Fig. 1. This cloth would finish 54 inches.

The warp has contracted 18 per cent in length. The filling lies straight, showing little, if any, shrinkage from loom to cloth. It is soft-twisted, containing but five turns per inch.

Very heavy silence cloths are constructed on the dorble or higher ply cloth principles.

LOOM REQUIRED.

For weaving filling backed silence cloths a heavy loom is required. Although they may be woven on cam looms, a dobby would be preferable, unless it was certain that the same pattern would be run on the loom continually. One warp and one shuttle only are required. On account of the coarse filling and the width of the cloth, the shuttles should be large.

FINISHING.

The processes of bleaching and napping constitute practically all the finishing these goods receive, being woven and finished white.

Carding and Spinning Particulars.

Silence cloth is made up of yarns which are made in the first division of mills, as given in a previous article. The counts of yarn vary according to the weight of the cloth and in the sample that has been taken for description are as follows, 11½s for filling and 2.75s for warp. These yarns are soft twisted to allow them to be easily brushed so as to cause a short, soft nap. The yarns are made of short stock, but as a general rule waste (except cut roving waste) does not enter into the mixing. The staple used would be about ¾ to ⅞ inch in length. The mixing should be large and at each mixing the cut roving waste laps should be mixed in. Mixing for this class of goods is done by hand and it is the general rule to work for production and not for quality, as a great many defects are covered up in the brushing of the cloth.

TWO PROCESSES OF PICKING

are used. The mixing after being allowed to stand is fed to the feeders. The seeds, fly, etc., should be taken out at regular intervals and care taken to see that the pin beater is properly set so that the correct amount of cotton will be fed to the breaker picker, to which the opener is generally attached. The beater of this picker is generally of a two-bladed rigid type and for this stock its speed is 1,550 revolutions per minute. The total weight of the lap at the front should be about 40 pounds or a 16½-ounce lap. At the finisher picker the doubling is four into one, the speed of the beater, 1,500 revolutions per minute, and the total weight of the lap 39 pounds or a 14½-ounce lap. A variation of not over 8 ounces either side of standard total weight should be allowed. Care should be taken to see that the drafts are properly directed so as to make an even lap that does not have a tendency to split or lick up. The eveners should be properly looked after to see that they are working properly and the dirt, seed, etc., cleaned from under and about the machines at regular intervals. If possible the pickers should be run so that they may be stopped as early as possible in the week so as to clean out the cages and feed rolls, etc.

AT THE CARDS

the draft should not exceed 95 and the wire fillet used on the cylinder should be No. 90s and on the doffer and top flats No. 100s. Grind and clean cards as given in previous articles. The settings of the different parts of the cards should be the same as those given for indigo prints in a previous article. The weight of the sliver should be 65 grains per yard and the production from 800 to 1,000 pounds per week of 60 hours. For this class of goods two processes of drawing frames are used. The frames may be fitted with either leather covered or metallic top rolls; generally speaking the former are preferred for various reasons. The doublings are 8 into 1 and the weight of the sliver at the finisher drawing frame is 75 grains per yard. The speed of the front roll is 400 revolutions per minute.

At the slubber the sliver is made into .40 hank. For

THE WARP YARN

this is spun into 2.75 (single) soft twist. For the filling yarn there is one process of fly frame at which the slubber roving is made into 1.25 hank. The setting of the rolls should be looked after to see that they are properly

spread and that the top rolls are in good condition. The speeder or fly frames should be scoured at least once a year. After passing the fly frame the roving is made into 11.5s, being put in single, on a frame having a 7-inch traverse, 1⅝-inch diameter ring and spindle speed of 6,500 revolutions per minute. This yarn is also soft spun.

ORLEANS LININGS.

Orleans linings comprehend a class of goods, of various qualities and patterns, having a cotton warp and worsted filling. They are used principally for lining the heavier garments for outer and winter wear, and are seen in black and all the fashionable shades. A large proportion are made with the 5-end twill, $\frac{1}{4}$, ground, Fig. 1, the selvedge being woven plain, or with

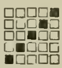


Fig. 1.

two picks in a shed and catch thread on the outside.

The cheapest grades are woven white, then piece-dyed in solid colors. Better grades have warp dyed yarns, the filling in the same being woven white and dyed to match the warp after it leaves the loom. By this method cotton warp yarns of two colors may be used, say black and white, the black being used for the body of the cloth and the white for the selvedges, the dyes used for the wool not affecting the cotton to any appreciable extent.

Advertising has educated the retail

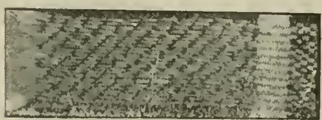


Fig. 2.

dealers and consumers to the fact that cotton warp goods with a white selvedge, the ground being of color, are more to be depended upon not to crock than similar cloths of solid color.

The worsted filling used is of a naturally lustrous type, which is capable of being made more lustrous by the finishing process. The yarns are required to be of good quality in order to finish and make up satisfactorily.

Fig. 2 illustrates a characteristic

ORLEANS LINING,

unfinished, containing three counts, colors and qualities of warp yarns. The ground warp is of a dark slate color (probably intended for black). This is of 30s counts, is reeded 3 ends per dent, and weaves as shown in Fig. 1. The section just inside the selvedge is solid white, is of 3-ply 100s counts, is reeded 8 ends per dent, and weaves two picks in a shed; there are 24 white ends on each side. The selvedges proper consist of 16 ends of 3-ply 60s black cotton on each side and are reeded 4 ends per dent; they weave plain. The selvedge ends are drawn 2 as 1 through each heddle; the remainder of the ends are drawn single.

CONSTRUCTION.

The construction of the cloth is 80 square, i. e., 80 ends and 80 picks per inch.

The fabric under consideration, Fig. 2, would require 9 harnesses, 5 for the ground, 2 for the white warp and 2 for the selvedges, and could be handled best on a dobby loom. By exceptional care in beaming the yarn it would be possible to put the three counts of warp on the same beam, but it is not advisable to do so for various reasons. One is that the 3-100s yarn, being so crowded in the reed, would under normal conditions take up faster than the ground warp and thereby become tighter. Being 3-ply yarn of good quality it might stand the strain of weaving all right, but would not stretch to any extent in finishing. If the ground cloth was stretched to its limit in finishing, the white yarn would be liable to break during that process. For the best results it would be advisable to run the white and selvedge yarns from spools, and the ground warp from the main beam. The white yarn should be run with a minimum amount of tension.

The white ends in this sample are so crowded in the reed as to cover the filling entirely; these would show solid white even after the filling was dyed to match the ground warp. It is something out of the ordinary to have such an elaborate selvedge as this on a lining fabric, the general run of the goods having a solid color ground and a few white ends for selvedge.

LOOM REQUIRED.

For ordinary lining fabrics where the ground weave does not occupy more than 5 harnesses, a cam loom with a selvedge motion would be the

best to use. A loom weaving 5 ends sateen could readily be changed over to weave a 5-end twill by changing the order of treading the cams, or, if the cams are cast in one piece, by changing the order of tying up the harnesses. One shuttle only is required.

FINISHING.

The finishing process consists of burling, singeing, crabbing, dyeing, drying and shearing and pressing on hydraulic press.

Carding and Spinning Particulars.

Orleans linings are made up of worsted and cotton yarns. The counts of these vary according to the grade of the lining desired. The cotton warp yarns of the sample analyzed are: main warp 30s, section just inside the selvedges, 3-100s, and the selvedge itself 3-60s. These counts of yarn are made in the third division of mills as given in a previous article. While the count of the main yarn is only what may be called a medium count, still, it is made in mills where fine counts are made. It must be understood that while the mills making fine count yarns may and do make low or coarse count yarns, the medium and low count mills cannot make high count yarns with equal success.

FOR THE YARNS

in the fabric to be described, three different lengths of staple cotton are used. These are mixed either by hand or with the bale breaker, the latter being the better method, because no matter how closely the laborers are watched, they do not break up the cotton as it should be done. The mixing should be allowed to stand as long as possible in order to dry out. Three processes of pickers are used and the same beater speed may be used for the three different lengths of staple. At the breaker picker a two-bladed beater of the rigid type is generally used. The speed of this beater is 1,500 revolutions per minute. Care should be taken to have the feed rolls and cages taken out and cleaned at regular intervals, which should be as frequently as possible. Be careful to get a lap that does not split. The weight of the lap at the breaker picker should be about 40 pounds for all three staples. At

THE INTERMEDIATE PICKER

the laps are doubled 4 into 1. The speed of this beater is 1,450 revolutions per minute. The weight of the lap at the front is 37½ pounds. At the finisher picker the laps are doubled 4 into 1. and the speed of the beater is 1,400 revolutions per minute. The total weight at the front may be the same for all staples or they may have different weights,according to the ideas of the ones in charge. If of different weights, the weight of the lap for the 30s yarn, which would be made out of 1⅛ to 1 3-16 inch staple cotton, would be 39 pounds or a 14½-ounce lap; for the 60s yarn (1 3-16 to 1 5-16 inch staple), 35 pounds or a 12½-ounce lap; and forthe 100s yarn (1½ to 1⅝ inch staple), 35 pounds or a 12½-ounce lap. The staples of cotton given above are for the fabric under description and do not apply to all fabrics made up of the same counts of yarn. Look out for the drafts and see that the required number of laps are always up at the different processes and also that

THE EVENING MOTIONS

are in perfect working order. A variation of half a pound either side of the standard weight is allowed, but all laps that vary more than this should be run over again through the finisher picker. Look out to see that the picker tender on the finishers does not pull enough lap off of a heavy lap to make it the required weight. Enough laps should be made between Monday and Friday noontime to enable the cards to be run the rest of the week. This is so that the picker men may have time to clean the pickers and make all repairs on the machines that are required.

THE CARDS

should be equipped with fine counts of wire fillet. The draft at the card for the 30s yarn should not exceed 95, for the 60s 100, and for the 100s not less than 100. The flats for the coarser yarn should make one complete revolution every 55 minutes, for the middle count in 50 minutes, and for the fine count in 40 minutes. Grind, strip and set as described in previous articles when these counts of yarns have been described. The weight per yard of the sliver should be 45 grains and the production 800 pounds for the 1 3-16-inch staple, 700 pounds for 1 5-16-inch staple and 550 pounds for 1⅝-inch staple for a week of 60 hours. All the card sliver for this fabric is combed. It is

THE GENERAL METHOD

to run the cotton in succession through the following machines: sliver lap, ribbon lap and comber, but a great many mill men nowadays prefer the following arrangement: one process drawing frame, sliver lap and comber.

If the former method is used, the doubling at the sliver lap machine (for an 8¾-inch width lap) is 14 into 1, and at the ribbon lap machine 6 into 1. The weight of the lap at the sliver lap machine is 295 grains per yard, and at the ribbon lap machine 275 grains per yard for 1 3-16-inch staple, 290 grains at sliver lap and 275 grains at ribbon lap for 1 5-16-inch stock and 280 grains and 265 grains for 1⅝-inch stock. Size at ribbon lap once a day, an allowance of five grains either side of standard weight being allowed before changing draft gear. At the comber the doubling is according to the number of heads that comber contains (6 or 8). The usual setting and timings should be used. The percentage of waste taken out at the comber is as follows: 15 for 1 3-16, 16 for 1 5-16 and 18 to 20 for 1⅝ inch stocks.

TWO PROCESSES OF DRAWING

are used, the doubling at the breaker being 8 into 1, and at the finisher 6 into 1. The weight of the sliver at the finisher drawing is 70 grains per yard for all the cotton. Size drawings four times a day, an allowance of 2 grains per yard either side of standard weight being allowed, before changing draft. At the slubber the sliver is made into .60 hank roving for all stocks.

To make 30s yarn the cotton is put through two processes of fly frames. At the first intermediate, the hank roving made is 2, and at thefine frame 6. This is made into 30s yarn on a warp spinning frame with a 2¾-inch traverse, 1¾-inch diameter ring, and a 6½-inch traverse. The yarn is then spooled, warped and put through the slashers.

THE SLUBBING ROVING

for the 60s yarn is put through three processes of fly frames, the hank roving being 1 at first intermediate, 3 at second intermediate and 12 at jack frame. This is spun into 60s yarn on a frame having the following particulars: 1½-inch diameter ring, 6-inch traverse, and spindle speed 10,000 revolutions per minute.

The yarn is then spooled, made into 3-ply yarn, spooled and run on to a selvedge warp.

The slubber roving for 100s yarn is also put through three processes of fly frames. At the first intermediate it is made into 2 hank, at the second into 6 hank, and at the fine or jack frame, 20 hank roving. This is spun into 100s on a spinning frame having a 2¾-inch gauge, 1⅜-inch diameter ring, 5-inch traverse and a spindle speed of 9,400.

After being made into 100s yarn it is spooled and twisted into three-ply yarn, after which it is spooled and warped and put through a slasher.

At the sliver lap machine, ribbon lap machine, comber and drawing frame the leather top rolls have to be varnished, and should be kept in perfect condition, both as to varnish and leather.

THE VARNISH USED

for the comber rolls should be of a heavier or rougher kind than that used for the other rolls. Several recipes for varnish have been already given, but the following will also be found to be an excellent one: For comber rolls use 8 ounces plate glue, 8 ounces ground gelatine, 12 ounces burnt sienna, 1 ounce oil originum, 3 pints acetic acid, 1 pint water. For the other rolls use the same mixture, excepting that vermilion should be used instead of the burnt sienna. This will make a much smoother roll than the varnish used for the combers. Many also varnish the front rolls of the slubber; when this is done the varnish used should be thinner than the others, being thinned with the acetic acid.

Dyeing Particulars.

Dyeing orleans linings, as in all other classes of goods, is done in a good many ways, according to the quality and the price the goods are sold at. A fine quality black orleans is woven with a black warp, which will stand the after processes of finishing and dyeing, which are crabbing, scouring, singeing and steam lustring; then dyeing either with a logwood black on a chrome mordant or one of the blacks which dyes the worsted filling at one dip in an acid bath. If the goods have white cotton threads in the selvedges, the dyer will select one of the blacks which have no affinity for cotton in the acid bath. Dyestuffs suitable for the warps on this class of goods are

THE SULPHUR BLACKS,

which are sold under several names, but all dye in the same manner in a bath composed of the dye, sodium sulphide, soda ash and common salt or Glauber's salts. Another black suitable for this class of goods is the diamine blacks, developed. These blacks are dyed in the following manner: first the warps are dyed in a boiling bath with the diamine black and Glauber's, then treated in a cold bath with nitrite of soda and muriatic acid, then in a third cold bath with phenylenediamine. Fast slate shades are dyed the same as the blacks, only using about half the proportion of dyes and shad-

ing with small portions of red or yellow of the same group of dyes. Orleans

FOR FANCY COLORS

are woven with white cotton warps and worsted filling, which are dyed either with the direct colors, which dye the cotton and worsted at one bath, or the four-bath method. The first method consists in dyeing in a bath composed of the direct cotton dyes and wool dyes which dye in a neutral bath with Glauber's salts at boil. The second method is to first dye the worsted filling with aniline dyes in a bath with acid and Glauber's salts. Wash well. Then treat the warps with tannic acid, or sumac, in a cold bath; then in a third bath, with tartar emetic, or one of the antimony salts; then in a fourth bath dye the warp to shade with basic dyestuff. The dyeing of this class of goods, like that of all other goods dyed in the piece, requires considerable practice and skill.

SHADOW CHECKS.

Shadow checks are a class of patterns of set check or block effects of a very faint character. Viewed from certain directions, they appear to have a faint stripe or to be without pattern entirely. They are seen in apparel goods of various materials, from silk to cotton, and usually in plain, simple twill, or other small regular weave. The goods are always shown in white, black or solid color.

Shadow checks are the faintest check effects that appear in woven goods and are made by arranging a certain number of ends of yarn twisted to the right and a certain number twisted to the left, and picking the filling in a similar manner. For example, a shadow check of the shepherd plaid type, i. e., a check with alternate blocks of equal size, might have the warp yarns arranged 10 ends of right twist and 10 ends of left twist alternately, the filling being inserted 10 picks of right twist and 10 picks of left twist.

A MODIFICATION

of this might be made by arranging the yarns in both warp and filling, 4 right twist, 2 left twist, 4 right, 4 left, 2 right, 4 left; 20 ends and 20 picks per pattern.

As the yarns are all of the same counts, material, quality and color, and are reeded equally, it follows that something out of the ordinary causes the check effect. It is an optical illusion, due to the reflection of the light that falls upon the fabric being deflected at a different angle in the sections composed of right twist yarns to the sections composed of the reverse twist yarns.

In a shadow check of the shepherd plaid type under consideration, the face yarns are arranged 16 of each

Fig. 1.

twist alternately in both warp and filling. The face weave is the 4-end basket.

LOOM REQUIRED.

These goods require box looms of the simplest type, with two boxes at one end and a single box at the other.

The manner of preparing the warps determines to some extent the type of shedding motion to use, whether cam or dobby. As the finished fabrics are required to be in one solid color, and some warp yarns differ from others only in the direction of twist in the same, care has to be exercised to keep the yarns where they belong and to tie in the right twist when an end breaks.

ONE OF TWO METHODS

may be adopted to assist in keeping the yarns in order:

First, tint the yarns of one twist with a light substance that may be noticeable in the loom and yet wash out readily before it is dyed, the other warp yarns being in the gray. By this method the warp yarns may all be readily drawn on one beam, and woven on a cam loom.

Second, place the different twists of yarns on separate beams and draw them through separate sections of harnesses. When this method is adopted it is advisable to use the dobby in preference to cams on account of the number of harnesses required.

Two colors or kinds of bobbins should be used, one for each kind of twist, so that the filling will not be liable to get mixed; or if cops without tubes are used, the shuttles should be marked so as to be easily distinguished. Tubes of different colors can be used if the cops are built on tubes.

IMITATIONS

of shadow checks have been shown to some extent in cotton warp and mo-

hair or lustre worsted filling goods. These are made with the warp yarn all the same twist, the shadow effect, warp way, being obtained by reeding some dents with more ends than others.

In a fabric of the type of goods under consideration, the yarns are arranged as follows:

WARP.

Ends.		Dents.
18	in	9
1		1
18		9
1		1
10		5
1		1
10		5
1		1
10		5
4		4
10		5
4		4
10		5
1		1
10		5
1		1
10		5
1		1

Total, 121 ends in 68 dents, per pattern.

FILLING.

Right twist yarn.		Left twist yarn.
10		6
10		6
6		6
6		6
6		10
6		10
6		6
6		6
6		6
62	+	62 = 124 picks per pattern.

As these fabrics are characterized by the pattern, the constructions of the cloths vary considerably. The fabric under consideration contains an average of about 55 1-3 ends per inch of 2-120s cotton, the same twist throughout. Each pattern contains 121 ends and measures 2 3-16 inches; 121 divided by 2 3-16 equals 55 11-35 or 55 1-3 per inch.

There are 48 picks of worsted per inch.

Shadow stripes are made by using only one kind of filling, the warp yarns being arranged as in shadow checks, with the take-up of the cloth regular. An irregular take-up would make a check effect.

Carding and Spinning Particulars.

The carding and spinning data for this class of fabric are those given in the article on batiste and need not be repeated here.

Dyeing Particulars.

These goods are dyed with 30 per cent Glauber's salt and run at a temperature of 190 degrees F. until the wool is dark enough, when the steam is turned off and the bath cooled down and the goods run until the cotton warp is dyed to shade.

LIGHT PINK.

One-half to 2 ounces erika pink.

BLACK.

Five per cent union black S B.

LIGHT BLUE.

Dye as pink, with ½ to 1 ounce tetrazo brilliant blue 6 B.

LIGHT SLATE.

Two ounces diamine black B H; dye as pink.

RED.

One-half pound benzo fast red 4 B; dye as pink.

YELLOW.

Dye as pink. Eight ounces chrysophenine.

ORANGE.

Dye as pink. One pound Mikado orange B.

SCARLET.

Dye as pink. One pound diamine scarlet B.

LIGHT WINE.

Dye as pink. One pound diamine Bordeaux B.

LIGHT AMBER BROWN.

Four ounces diamine catechine G; 4 ounces diamine fast yellow B; dye as pink.

TOBACCO BROWN.

One-half pound diamine brown B; 2 ounces diamine fast yellow B; dye as pink.

LIGHT TAN.

Dye as pink; 4 ounces diamine bronze G; 2 ounces diamine fast yellow B.

LIGHT GREEN.

Dye as pink; 10 ounces diamine green G; 5 ounces diamine fast yellow B. Top with fresh bath; 6 ounces brilliant green G.

BARATHEA.

Barathea, or barrathea, is a name used to denote a certain effect in woven fabrics, obtained principally by the manner in which the warp yarns are interlaced.

The effect combines to a greater or less degree several well-known types of

woven effects. Viewed in certain ways the effect is that of a stripe. Upon close examination it appears like a broken cord, and yet somewhat like a basket weave.

An examination of Fig. 2, the weave will reveal how these effects are obtained. This weave is complete on 24 ends and four picks, having been repeated in the picks. At the points indicated by the space there is a break in the regular formation of the pattern, caused by one section, which is in all respects like the other, in so far as the effect it makes is concerned, being raised half way of one

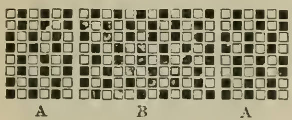


Fig. 2


Fig. 3.

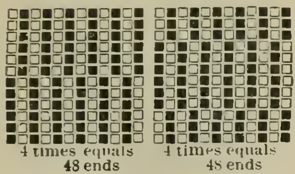


Fig. 4.

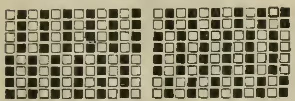


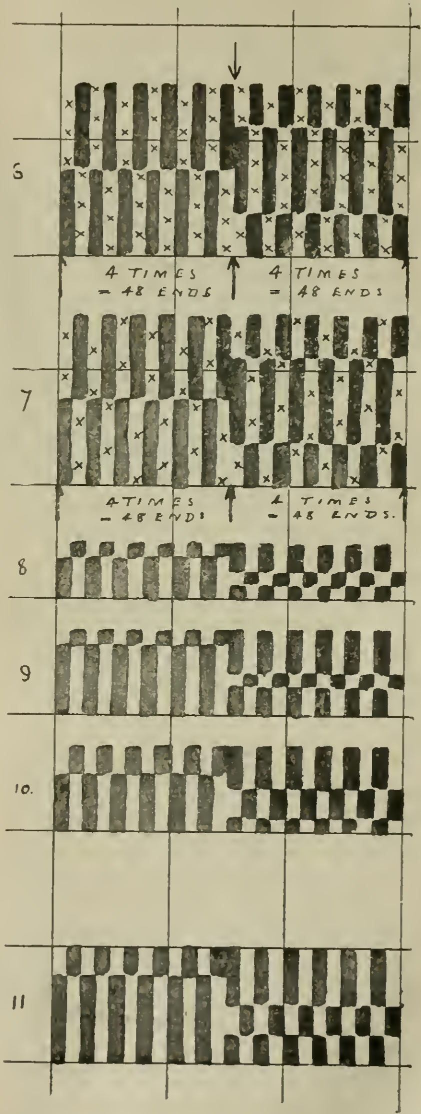
Fig. 5.

cord above the other, or, as it is termed, one section is "set across" the other. It is at these points that a cut effect is obtained, which defines the stripe warp way. One repeat of the weave, in the number of picks it contains, is represented in the cloth by two repeats of the effect, or two cords warp way.

Section A, or B, of Fig. 2 is simply repeats of warp cord weaves. Each section represents six repeats of the two end cord, Fig. 3, and if woven alone would form an unbroken cord or rep effect across the cloth. The greater the number of ends in each section of the weave, as compared with the number of picks, the more pronounced will be the cord appearance. The nearer square the complete pattern appears in the cloth, the more will it resemble a basket effect.

The patterns vary from square to effects several times longer filling way than length way of the cloth.

When constructing cloths with warp



cord weaves, of which barathea weaves are an extension, considerably more ends than picks per inch are required, the object being to cover the filling yarns entirely.

Barathea fabrics in all-silk, or with silk warp and cotton filling, are ex-

tensively used in the manufacture of gentlemen's neckties. They are usually shown in white, black, solid and staple colors, although occasionally made in more than one color.

The construction of two of these fabrics is as follows: White, fine silk warp and spun silk filling, weave, Fig. 2; 280 ends and 72 picks per inch; 23 1-3 ribs per inch. Black, fine silk warp, ply cotton filling, weave, Fig. 4; 480 ends and 100 picks per inch; 10 ribs per inch. They are seldom made with larger effects than this for tie silks.

Baratheas are excellent wearing fabrics, the yarns exposed to wear, the warp yarns, being necessarily fine and of good quality. They are made to differ in the sizes of ribs used, small effects being used more than large ones. The size is regulated by one or both of two factors; first, the number of ends and picks in a repeat of the weave; second, the number of ends and picks per inch, of yarn in the cloth. Figs. 2, 4 and 5 are the weaves generally used, the number of ends in each section varying accord-to requirements.

The two sections comprising the repeat, no matter how many ends used, usually contain an equal number of ends.

With the weaves already noted the effect produced on the back of the cloth is an exact duplicate of that on the face. A modification or extension of these weaves, used principally in the larger effects, is shown in Figs. 6 and 7.

The solid marks in Fig. 6 indicate a weave that would form an effect on the face of the cloth similar to that made with weave Fig. 4. These represent where the warp would show on the face, coming together and covering the raisers indicated by the crosses. The latter indicate a broken plain weave on the back.

Fig. 7 would make the same face effect in the cloth as Fig. 4, if woven with the same construction, but the back of the cloth would show a broken twill effect. A firmer fabric would be produced with weaves 6 and 7 than with No. 4, with the same amount of material.

Further extensions of these weaves are illustrated in Figs. 8, 9, 10 and 11.

The patterns indicated may be woven on ordinary single box silk dobby looms. If two colors are used in the same fabric they are arranged in the warp. As the warp covers the filling there is nothing to be gained by using more than one color of filling.

LOOP OR KNO CLOTH.

Loop or kno cloths are characterized by small loops of warp yarn projecting from the face of the cloth, usually in set, regular order.

They are novelties, not standard goods, and as such are not limited to any one construction, quality or material. They are generally made with cotton, wool or silk yarns. The yarns forming the loops are used for ornamental purposes only.

Fig. 1 is an example of a loop pattern on a $\frac{2}{}{}_{2}$ twill ground. The loop yarns in this particular instance

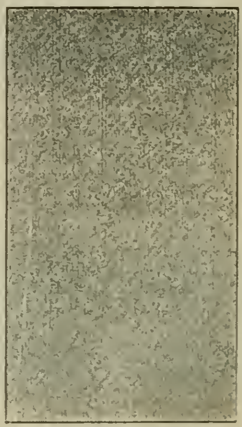


Fig. 1.

are arranged as extras, not showing on the face of the cloth, except where they are required to form the loops. Figs. 2, 3 and 4 show the weave, harness draft and chain draft respectively to produce Fig. 1. The ground ends are drawn through harnesses 1, 2, 3 and 4, and the loop yarns through 5, 6, 7 and 8. The weave is complete on 52 ends and 60 picks, including 4 wire picks.

THE LOOP YARNS

weave $\frac{1}{}{}_{3}$, except where they are required to loop, and are tied between two face ends raised on opposite sides of the ties. Crosses in Fig. 2 show where the loop yarns are raised over the wires to form the loops. Circles indicate tying points, two ends working together as one. Crosses in Fig. 4 indicate where the wires go between the warp yarns in place of the regular shuttle. All the face warp is down, and the take-up motion of the loom is stopped on these picks.

THE CONSTRUCTION

of sample Fig. 1 is 85.8 ends and 66 picks per inch average. The ground cloth is 66 square and there are 12 loop or extra ends to every 40 ground ends. The warp is all two-ply yarn of similar count. The filling is single yarn.

LOOM REQUIRED.

Loop effects may be woven on loop pile carpet looms, or on ordinary dobby or jacquard looms provided with special mechanisms or attachments, and beam stands, upon which one or more extra beams may be placed, varying according to requirements. The loop yarns take up faster, and more intermittently, than the ground yarns, requiring a greater length of warp for a given length of cloth.

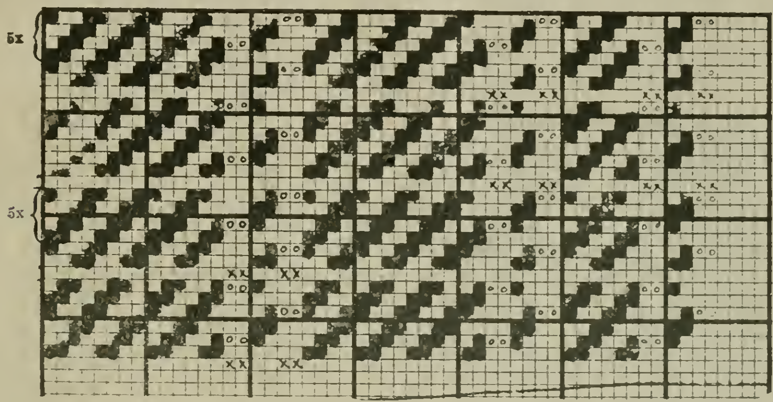


Fig. 2.

There are

VARIOUS METHODS

by which the loops may be obtained, each of which requires different attachments. Some of these are as follows:

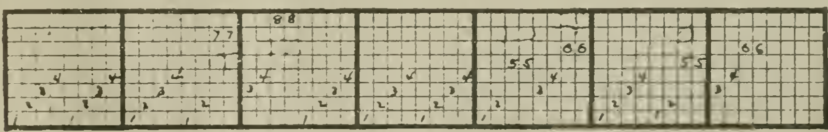


Fig. 3.

First. The loop yarns are arranged to work gauze or leno in connection with wires fastened to one or more of the harness frames. These yarns go from one side to the other of the wires and as the cloth is drawn down, slide over and away from them and are left in loops.

Second. Wires are inserted across the cloth in place of the regular shuttle, on the picks required to form the loops, on the principle applied when making loop pile carpets. These wires are automatically withdrawn after the ground filling has secured the loops.

Cloth illustrated in Fig. 1 has been made on this principle. Two extra spools or beams have been used, one for ends on 5 and 6, and one for ends on 7 and 8.

Third. The loop yarns are allowed to come off the warp beam at about the same tension as the ground ends, except on the picks when they are required to loop, when they are forced forward a greater length by a positive motion. On these picks the yarns are eased after the shuttle has crossed the shed, and the shed closed before the reed reaches the fell of the cloth. This is, perhaps, the simplest method.

Fourth. The loops may be made on a loom with a terry reed motion (see article on terry toweling), but this is liable to make the cloth look barry where the three picks are beaten up together, as the ground ends offer considerably more resistance than on an ordinary terry towel fabric, there being only a relatively small portion of the ends weaving terry.

Dyeing Particulars.

LIGHT SLATE.

One per cent diamine black B H; 1

per cent sal soda; 20 per cent Glauber's salt.

ECRU.

One-half per cent diamine catechine G; ¼ per cent diamine fast yellow B; 1 per cent sal soda; 20 per cent Glauber's.

NAVY BLUE.

Eight per cent immedial new blue G; 10 per cent sodium sulphide crystals; 2 per cent caustic soda lye, 75 degrees Tw.; 30 per cent Glauber's.

BOTTLE GREEN.

Eight per cent diamine black H W; 2 per cent diamine fast yellow B; 2

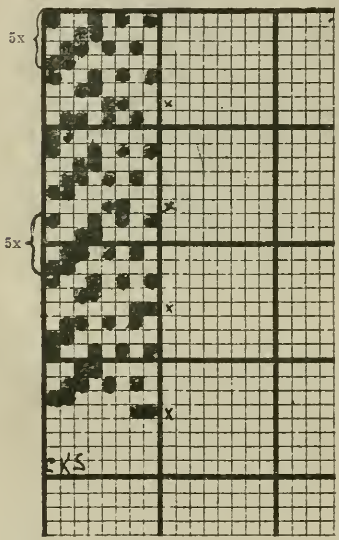


Fig. 4.

per cent sal soda; 20 per cent Glauber's salt.

GRAY.

One per cent immedial black N L N; 1 per cent sodium sulphide; ½ per cent caustic soda solid; 20 per cent salt.

MAROON.

Five per cent immedial maroon B; 6 per cent sodium sulphide; 1 per cent caustic soda solid; 20 per cent salt.

MODE.

One per cent immedial brown B V; 1 per cent immedial yellow D; 2 per cent sodium sulphide; ½ per cent caustic soda solid; 20 per cent salt.

GREEN.

Eight per cent immedial green G G; 10 per cent sodium sulphide; 2 per cent caustic soda solid; 20 per cent salt.

BLACK.

Six per cent para diamine black B B; 2 per cent sal soda; 20 per cent salt.

RED.

Five per cent diamine fast red F; 2 per cent sal soda; 20 per cent salt.

PEA GREEN.

One-half per cent diamine green G; 1 per cent sal soda; 10 per cent salt.

SKY BLUE.

One per cent diamine sky blue F F; 1 per cent sal soda; 15 per cent salt.

CREPONS.

These fabrics are made up of a combination of cotton worsted, or cotton, worsted and silk. The goods are usually piece dyed and used principally for ladies' wear in the form of skirts. The character of the patterns for these fabrics is such that the best effects can only be obtained with the use of the jacquard loom. In this treatise we will consider the fabric as woven on the harness loom. The harness loom is utilized either because the manufacturer has no jacquard loom on hand or wishes to reduce the cost of weaving.

THE WEAVE

for these fabrics is based on the doubled cloth system. Under the head of doubled cloth we comprehend the combining of two separate textures into one fabric requiring separate warp and filling threads for each texture. Combining the two textures into one fabric is effected by interlacing the warp or filling threads, or both, of one texture into those of the other at regular intervals.

The pattern being effected with the warp and filling of one system of threads forms a raised figure on the face of the goods. This raised figure depends as much on the nature of the yarn as it does on the weave. The cotton in the goods is principally used as a back for the raised figure; the worsted forms the figure. If silk is used, the silk forms the figure and the worsted or wool goes into the body of the goods, and in the finishing of the fabric contracts considerably, thus accentuating the figure.

In a foregoing paragraph it was

suggested that the best effects are only obtainable with the use of the jacquard loom, by reason of the fact that the patterns are too large to be operated on the harness loom, and as a rule the quality of the fabric is not made as fine as the jacquard loom fabric; however, a harness loom that can operate 24 harnesses can produce some very clever effects. The variety in regard to texture in these fabrics can be comprehended best by comparing several fabrics of different textures. Some idea may be obtained by the following constructions.

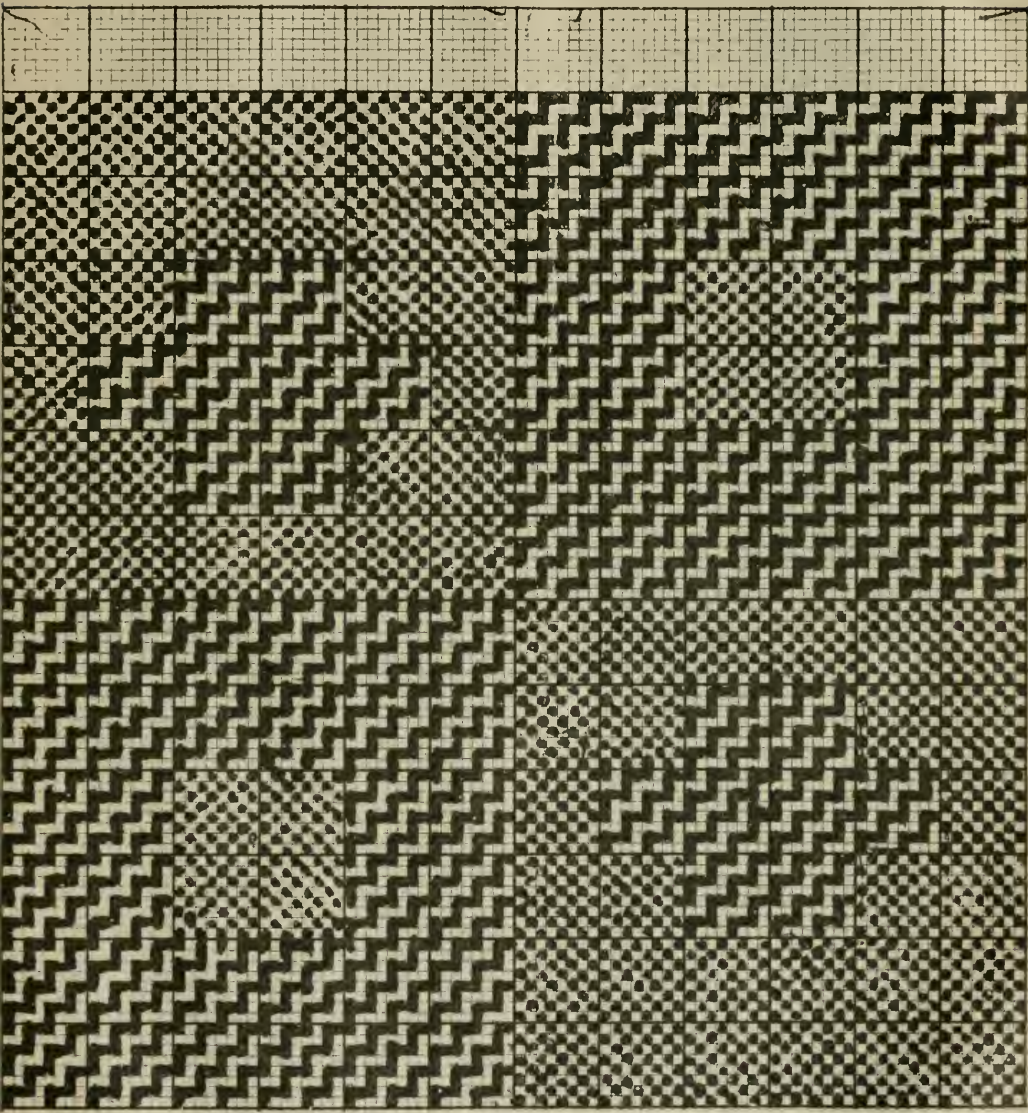


Fig. 1.

A texture for a cheap grade crepon: Width in reed, 56 inches; finished at 52 inches; warp plan, one end face

warp, 2-32s mohair, 1 end back warp, 2-50s cotton; 15x4 reed; filling, 1-30s cotton filling; 60 picks.

A better grade may be made with the same warp plan, by using one pick

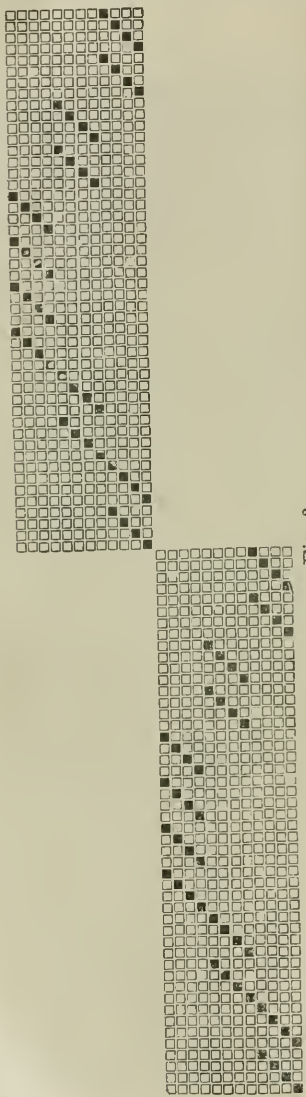


Fig. 2

worsted to alternate with one pick cotton. The worsted will be face filling.

The character of the pattern for this grade of crepon may be any conventionalized figure, arranged usually in some zigzag manner, imitating as much as possible the larger patterns made on jacquard looms. The raised figure or blister effect covers as much space or divides equally with the ground in most fabrics of the cheaper grades. In the better grades there is usually more figure than ground. Fig. 1 shows a design illustrating the crepon weave and proportion of figure to ground for fabrics on 20 to 24 harnesses. Fig. 2 shows the drawing-in draft.

A texture for a fine grade of crepon that may be woven either on the jacquard or harness loom:

Warp arrangement, 4 ends face warp, 2 ends in 1 heddle, 1¼ dram silk; 20x3 reed; 1 end back warp, 2-60s cotton; filling 3 picks, 1 dram silk, 1 pick, 2-30s worsted; 80 picks per inch, 60 face picks, 20 back picks.

This construction can be made up to the best advantage, in regard to pattern, with the jacquard loom.

In finishing the cheaper grades, wherein the fabric is made up of cotton and worsted, the cotton yarn is dyed before it reaches the loom. After the fabric is woven it is dyed for the worsted. The prevailing color for these fabrics is solid black. The worsted in the goods contracts considerably during the finishing, producing the blister effect by which the goods are characterized.

Carding and Spinning Particulars.

Crepon is made up in many different ways and out of different fibres, sometimes wool and cotton yarns being employed. Other combinations are cotton and silk, wool and worsted, all wool, all worsted, all cotton, etc. When the same fibre is used throughout the cloth, the twist put in the yarn plays a very important part. For example, one yarn, generally the warp, is very tightly twisted, while the filling yarn is stock twisted. When the cloth constructed from these yarns is dyed, the action of the dye on the yarns is entirely different and contracts one more than the other, thus causing the raised or puffed effect of crepon.

ANOTHER METHOD

used is to have part of the warp yarn with the regular twist, while another part has a reverse twist put in, the effect produced being the same as before. In the cloth under description the backing or picking warp is to be 2-60s cotton yarn. To produce this yarn the mechanics' data, etc., required would be as follows: The mixing should be as large as possible and should be allowed to stand at least 48 hours before being used, so that the cotton will

have become thoroughly expanded before being used.

THE COTTON

should be of a good middling grade and of 1 5-16-inch staple. The raw stock is passed through an opener and three processes of picking. The hopper of the opener should be kept full of cotton, a small percentage of good waste from the machines up to the slubber being put in at this machine. The speed of the beater, which is generally of the two-bladed, rigid type, should be at least 1,500 revolutions per minute. The weight of the lap at the front end should be 40 pounds, or a 16-ounce lap (the total weights given are for a lap 40 yards in length). Four of these laps are put up at the intermediate picker and run through and made into a lap weighing 38 pounds, or a 10-ounce lap. The speed of the beater for this machine is 1,450 revolutions per minute. These laps are in turn put up at the back of

THE FINISHER PICKER.

The speed of this beater is 1,350 to 1,400 revolutions per minute. The weight of the lap at the front is 39 pounds, or a 14½-ounce lap. Every lap should be weighed and all laps varying more than one-half a pound from the standard should be put to the back of the finisher picker and run through again. It is very important to see that this is done, because nothing will throw yarn numbers off more quickly than laps that vary.

Another important question in the picker room is what to do with the

CUT ROVING WASTE.

Of course, the best thing to do is not to make it. As it is made, the next question is how to use it up. Up-to-date mills are installing a cut roving waste machine in their plants, but there are a great many mills which have no such machine. In this case the waste is put through the intermediate picker, the two centre laps at the back of the picker being removed and the waste spread evenly between the two remaining laps. To help stop these laps from licking, four or six ends of slubber roving are run into the lap at the front end of the picker. These laps are run in with the raw stock laps at the back of the finisher picker in the proportion of one lap of cut waste to three laps of cotton as long as they last. As little cut waste should be run as possible because it not only causes licking laps, but it

CAUSES UNEVEN WORK

and weak roving and yarn; it is continually breaking back in the creels, requiring one and sometimes two teeth of twist more than when not used. The laps from the picker are put up at the card, the setting of which should be the same as given in previous articles when the same grade and staple of cotton were used. The speed of the flats should be one complete revolution every 37 minutes. The speed of the licker-in should be 300 revolutions per minute. The production should be about 550 pounds for a week of 60 hours. Watch all the setting points. Set at least once a month all over. Grind cards lightly and often. Strip three times a day and keep cards as clean as possible and well oiled. Doff cans when full and don't allow them to become so full that they fall over. Care should be taken that no single or double is allowed to pass through.

The

DRAFT OF THE CARD

for this kind of work should not be less than 100 and the sliver should weigh 50 grains. This sliver may be either combed or passed directly to the drawing frame. Generally, however, it is combed. Different methods and machines are used nowadays for combing, but the general method is to have the card sliver run through a sliver lap machine, where it is doubled 14 into 1, and the weight of the lap is 300 grains per yard. From here it is passed to the ribbon lap machine and doubled 6 into 1. The weight of a yard of lap at this machine is 290. From here it is passed to

THE COMBER

and doubled 6 into 1, the weight of a yard of sliver being 60 grains. At the ribbon lap machine the laps should be sized once a day, and if the weights are coming uneven, twice or even three times a day. The comber sliver is next put through two processes of drawing, the doublings being 8 into 1 at the breaker and 6 into 1 at the finisher. The weight of sliver at finisher is 80 grains per yard. This cotton is then put through the slubber and made into .40 hank roving. At the first intermediate the roving is 1 hank and at the second 3 hank, while at the jacks the roving is 12 hank. Be careful of the settings of the rolls. They should not be spread too far apart, causing a strain, nor should they be so close as to cause a breaking of the fibre. The 12-hank roving is

spun into 60s on a spinning frame having a 2¾-inch gauge of frame, 1½-inch diameter ring, and a 6-inch traverse. The twist put in is in excess of that generally used for warp yarn, sometimes as high as 6.40 times the square root of the count being used, instead of 4.25, the usual twist. After being spun, the yarn is spooled and twisted into 2-ply 60s yarn, after which it is warped and run through the slasher and beamed.

Dyeing Particulars.

Crepons are woven sometimes with a black warp, dyed with sulphur black and piece dyed with wool colors.

BLACK.

Five per cent anthracene chrome black P F; 4 per cent acetic acid; 1 per cent oil of vitriol. Boil 45 minutes. Afterchrome with 1 per cent bichrome 30 minutes.

NAVY BLUE.

Four per cent azo chrome blue T B; 4 per cent acetic acid; 1 per cent oil of vitriol. Afterchrome, 1 per cent bichrome 30 minutes.

The warps are also colored with immedial sulphur colors to shades required and dyed in the piece with wool colors.

BROWN.

Two per cent anthracene chrome brown D W; 1 per cent anthracene acid brown G; ½ per cent anthracene yellow B N; 3 per cent oil vitriol. Afterchrome, 1½ per cent chrome.

PEARL.

One-quarter per cent anthracene chrome blue G; 1 per cent oil of vitriol. Afterchrome, 2 ounces bichrome.

SLATE.

One per cent anthracene chrome blue G; ⅛ of an ounce anthracene yellow B N; 2 per cent oil of vitriol. Afterchrome, 1 per cent bichrome.

MODE.

Four ounces anthracene chrome blue G; 2 ounces anthracene chrome red A; 1½ ounces anthracene yellow B N; 2 per cent oil of vitriol. Afterchrome, 1 per cent bichrome.

SNUFF BROWN.

One-half per cent anthracene chrome red A; 1½ per cent anthracene chrome brown D; 1¼ per cent anthracene yellow B N; ¼ per cent anthracene chrome blue F; 3 per cent oil of vitriol. Afterchrome, 1½ per cent bichrome.

GREEN.

Three per cent anthracene chrome blue G; 1 per cent brilliant milling green B; 1½ per cent anthracene yellow B N; 4 per cent oil of vitriol. Afterchrome, 2 per cent bichrome.

WINE.

Two per cent wool red B; 1 per cent anthracene chrome blue R; 3 per cent acetic acid; 1 per cent oil of vitriol. Afterchrome, 1 per cent bichrome.

SAGE.

Two ounces anthracene chrome blue B B; 2 ounces anthracene yellow B N; 1-16 ounce anthracene red A; 1 per cent oil of vitriol. Afterchrome, 1 per cent bichrome.

SHADE CLOTH.

Window Hollands

Shade cloths for window shades, window curtains or window blinds derive their name from the use to which they are intended to be subjected. They comprise a large variety of counts, widths, weights and qualities. The lower grades are made from low to medium qualities of stock, extending to the usual grades of print cloth fabrics. Better grades are made in all grades of cotton to the best Egyptian and Sea Island.

The widths vary from a few inches for small door and house windows to three or four yards, or more, for large plate glass store windows. The general run of goods is of medium width. The narrow shades are made by cutting a wider cloth in two or more sections or narrow widths. For example, a shade cloth finishing 54 inches wide might be cut in three strips, each of which would be 18 inches in width. The

MEDIUM-WIDTH GOODS

are woven in one width, with two selvedges only, one on each side. It is not necessary to have special selvedges for each width (for cloth to be cut up into two or more widths) because the sizing or filling put on to and into the goods during the finishing process prevents the edges from unraveling for a considerable time after they have been cut if they are handled with due care.

The wide shade cloths are usually considerably heavier in proportion than the narrow goods on account of the extra hard usage to which they are subjected.

THE DISTINGUISHING FEATURE

of these goods is in the smooth, polished and firm appearance of the same after they have been finished.

They are usually finished in white or solid colors, or with a printed heading in addition.

The cloth basis of the shade may be any one of many of the plain woven cloths that have been described, with the possible extension in width as noted.

A shade cloth under consideration has a plain cloth for a basis of the following construction: Width, 44 inches; ends per inch, 64; picks per inch, 64; length, 100 yards; weight, 3⅛ yards per pound; warp counts, 22s; filling counts, 24s. The finished width of this cloth is 42 inches.

LOOM REQUIRED.

The loom required will vary in slight details according to the weight and width of cloth required. For narrow goods the automatic or quick running plain looms will answer all requirements, the weave being plain in all cases, with one warp and one filling only required.

The principal change necessary to weave wide fabrics is in placing two or more warps in the loom, end to end, instead of one large beam. These sectional warps are run on shells instead of solid beams. The rod running through them all is supported on bearings between every two shells, as well as at the ends, when in the loom.

Combining warps in this manner obviates the necessity of having to prepare them on a very wide slasher, which would otherwise be necessary to accommodate the wide beam, as well as overcomes the difficulty caused by long beams warping and getting out of true.

FINISHING.

The cloths are woven white, then piece-dyed in the color or tint required.

One method of finishing 42-inch shade goods is as follows: Shear and singe on both sides so that all loose fibres are dispensed with; wash, bleach, dye, mangle and dry. After being cooled, run through a damping machine and allow to remain in a damp state for a short time, then stretch on the belt-stretching machine to 43 inches in width, after which fill on the friction starch mangle with the following mixture: Maize or cornstarch, 100 pounds; oleine oil, 50 per cent, two quarts; carbolic acid, one-half pint. Water sufficient to make, when boiled, 100 gallons. After filling, dry on drying machine and allow to cool; run through damping machine and allow to lie at least two hours. Run through wide or Scotch hydraulic mangle; strip, turn and repeat the process. Strip, run through canroy machine.

For white shade cloth the dyeing process is not necessary. Fancy shade cloths, in addition to the processes noted, are run through a printing machine for the purpose of receiving a pattern at one end of each shade. The color or tinsel applied is of a firm character. The patterns are printed every so often in the piece, according to the length of shade required, and extend from side to side.

Carding and Spinning Particulars.

For carding and spinning particulars the reader is referred to the warp data in the article on "Buckram," and to the filling data in the article on "Book Muslin."

Dyeing Particulars.

These goods are dyed on the jig in rolls of about 10 pieces of 50 yards, with sulphur colors.

ECRU.

One-half per cent immedial cutch G; ⅛ per cent immedial yellow D; 1 per cent sulphide sodium; 1 per cent soda ash; 20 per cent salt; afterchromed with ½ per cent chrome.

OLIVE.

One per cent immedial yellow D; 2 per cent immedial dark green B; 2 per cent immedial olive B; 5 per cent sulphide sodium; 2 per cent soda ash; 25 per cent salt; afterchrome with 1 per cent chrome.

NAVY BLUE.

Ten per cent immedial blue B; 2 per cent immedial indone R; 12 per cent sulphide sodium; 2 per cent caustic soda; 25 per cent salt.

DARK GREEN.

Ten per cent immedial green B B; 10 per cent sulphide sodium; 2 per cent caustic soda; 25 per cent salt.

MAROON.

Ten per cent immedial maroon B; 10 per cent sulphide of sodium; 2 per cent caustic soda; 25 per cent salt; aftertreat with 1 per cent chrome.

SLATE.

One per cent immedial black N L N; 1 per cent sulphide sodium; 1 per cent caustic soda; 10 per cent salt; aftertreat with ¼ per cent chrome.

RED.

Eight per cent diamine fast red F; 2 per cent sal soda; 30 per cent salt; aftertreat with 1½ per cent fluoride of chrome.

BROWN.

Five per cent immedial brown B; 5

per cent immedial brown G; 10 per cent sulphide sodium; 2 per cent caustic soda; 25 per cent salt; afterchrome with 1½ per cent chrome.

BISHOP'S LAWN.

Bishop's lawn is a fine, plain woven fabric, slightly lighter in weight than linon or India linon. It is a white fabric with a blue tint and is principally used for light dresses and underskirts.

Like a great many other plain cotton goods, bishop's lawn varies slightly in weight, count and quality, but the latter is usually very good.

The finish and blue tint seen in these goods are the principal characteristic features which distinguish them from other fine cotton fabrics. A cloth of the same construction and quality might be known by another name if finished differently.

The

ANALYSIS

of a bishop's lawn of good quality indicates the following construction: ends per inch, 104; picks per inch 112; warp counts, 100; filling counts, 120; finished width, 27 inches.

The ground of the fabric is reeded two ends per dent. The selvedge is neat, the yarns being arranged in a somewhat unusual manner. From the ground cloth outwards, they are as follows:

12 ends singles in four dents; 24 ends as 12 in six dents; 8 ends as 2 in one dent; total, 44 selvedge ends in 11 dents on each side.

The selvedge and ground ends are of the same counts.

CALCULATIONS.

To find number of ends in warp: 104 (sley) divided by 2 (ends per dent) equals 52 dents per inch; 52x27 (width) equals 1,404 dents occupied by warp; 1,404—22 for selvedges equals 1,382 dents for ground; 1,382x2 equals 2,764 ground ends plus 88 selvedge ends total 2,852 ends.

To find width in reed, assuming 10 per cent shrinkage from warp to finished cloth: 27 inches divided by .90 or 90 per cent equals 30 inches in reed.

To find weight of warp, assuming 105 yards of warp for 100 yards of cloth:

$$\frac{2{,}852 \text{ (ends) x } 105 \text{ (length)}}{100 \text{ (counts) x } 840} = 3.565 \text{ lbs. warp in } 100 \text{ yards cloth.}$$

To find weight of filling in 100 yards of cloth:

$$\frac{112 \text{ (picks) x } 100 \text{ (length) x } 30 \text{ (width in reed)}}{120 \text{ (counts) x } 840} = 3.333 \text{ lbs. filling.}$$

To find weight of cut:

3.565 lbs. warp.
3.333 lbs. filling.

6.898 lbs. weight of 100 yard cut.

To find number of yards per pound: 100 (length) divided by 6,898 (weight) equals 14.49, say 14½ yards per pound.

LOOM REQUIRED.

This fabric may be woven on any of the light running cam, single-box, looms. One beam only is required. On account of the large number of ends per inch, care should be taken not to have a coarser twine harness than is absolutely necessary. If difficulty is experienced with crowded heddles and ends, the cone motion may be substituted for the cams with advantage.

FINISHING.

After being prepared and bleached in the ordinary manner, the goods are opened out to the full width and run through a light starch, blued to suit requirements, on a starch mangle, and dried. They are then dampened, calendered on a "swissing" or "rolling" calender, folded and made up as required.

Carding and Spinning Particulars.

Bishop's lawn is made in mills having the equipment of machinery as given in the third division. i. e., machines for making fine counts of yarns. On this class of goods the sampling of the cotton as to grade and staple is a very important part in the finished fabric. The counts of the yarn of the sample of the cloth taken for description are for the warps 100s and for the filling yarn 120s. For these counts the cotton used would be Sea Island and the staple 1¾ inches. Every bale should be graded and stapled before it is allowed to be put into the mixing, and this mixing should be allowed to stand as long as possible and also should be as large as convenient. For this class of cotton it would be better if it were opened and put through a blower and then sent through a line of trunking, so that it would be dried out as much as possible before being worked.

ONLY TWO PROCESSES

of pickers and an opener are used for this cotton, because it should have as little beating as possible to get the

dirt out. The usual instructions that have already been given, relative to the opener and pickers, should be followed. The speed of the breaker beater (which should be of a two-bladed rigid type) should be 1,350 revolutions per minute, and the lap in front should weigh 29 pounds. These laps are put up at the back of the finisher picker and doubled 4 into 1. The speed of this beater should be 1,200 revolutions per minute, which gives the cotton passing through about 29 beats or blows per inch. For this class of goods it is not the general custom to mix in cut waste. The picker room should be looked after to see that all the eveners are working properly and to try and make laps that don't split. In order to do this, look after

THE DRAFTS

to see that they are putting the cotton passing through the picker in the proper place. At the finisher picker the laps, as they are taken off, should be weighed, and all those having a variation of half a pound either side of standard should not be allowed to be put up at the card, but should be run over again. The total weight of a lap at the finisher should be 30 pounds or a 10-ounce lap. These laps are put up at the card. This card should be set close at the points between the cylinder and doffer and cylinder and flats and also between the cylinder and licker-in, but between the licker-in and feed plate the setting should be so that the distance between the bite of the feed roll and teeth of the licker-in is just a little greater than the length of the staple. It is

A GENERAL FAULT

of carders to set these two parts the same for all lengths of staple, and this should be looked after and remedied, because if the proper distance is not maintained between these parts the stock will be shorter in length at the front (if set too close), or will not be properly carded (if set too far apart). For long-staple cotton, some overseers claim that it is an advantage to reduce the speed of the licker-in. Their reason for so doing is that they claim that the licker-in is nothing more or less than a beater, and if we slow down the beater for long-staple cotton, why not slow down the licker-in in the same proportion? The wire fillet used on the cylinder should be No. 110s, or No. 34s wire, and for the doffer and top flats No. 130s, or 36s wire. The

SPEED OF THE FLATS

should be one complete revolution every 38 minutes and the licker-in 30 revolutions per minute. The cards should be stripped three times a day, and ground at least once a month. The flats should be ground so as to always have a sharp needle point. If possible, the flats should be taken off and ground on a flat grinding machine and it will be found that the best results will be obtained. The production of a card for a week of 60 hours should be 225 pounds; the weight of the sliver, 35 grains per yard; the draft of the card being 125. In this article, we have drafted high and carded light. In some cases, for this kind of goods and cotton, overseers have been known to draft as high as 180, which makes our draft of 125 look rather small. After passing the cards, the sliver is put through either a line of drawing or a sliver lap machine, according to the lay-out of the mill. In mills that are now being built and in the old mills that are installing new machinery,

THE COMBERS

being put in are generally of the eight-head type, having laps 10½ inches wide. The weights, etc., that we give in this article will be for the older type of 8¾-inch-width laps. The weights for larger laps may be obtained by proportion. We will also assume that the equipment is as follows: Sliver lap, ribbon lap and combers.

The doubling at the sliver lap machine is 14 into 1, and the weight of the sliver is 225 grains per yard. At the ribbon lap machine the doublings are 6 into 1, the weight of a yard of lap being 200 grains per yard. In some mills, the sliver laps are made a little heavier and only five doublings used at the ribbon lap. When this is the case, the weight of a yard of sliver lap is 270 grains per yard.

For the top leather rolls of these machines use a

VARNISH

as follows: Seven ounces gelatine glue, one quart acetic acid, two teaspoons oil of origanium. Color with burnt sienna. In dog-day weather or for slippery cotton use ground charcoal and gum arabic. This varnish may be also used for the drawing frames and comber rolls (both detaching and those in the draw box). The laps from the ribbon lap machine are put up at the comber. At this machine the percentage of waste taken out is 22 to 25. The speed is 85 nips per minute. The rolls should be varnished at least once every two weeks, needles picked and brushes cleaned once a week. Comber percentages

should be taken every time a comber is changed from one stock to another and the percentage of four every day. Set comber same as for Indian lawn. The weight of the sliver should be about 35 grains per yard. The comber cans should be put up at the back of the drawing frame, being doubled 6 into 1 at both the breaker and finisher. The

WEIGHT OF THE SLIVER

at the finisher drawing should be 65 grains per yard. Watch the stop-motions to see that they are all in proper working order and also the roll settings; also keep the rolls well varnished. At the slubber the drawing is made into .80-hank roving, after which it is put through three processes of fly frames. At the first intermediate it is made into 2.25 hank, at the second into 5, and at the fine frame into 20 hank for warp yarns; for filling yarns the slubber and first would be the same hank, at the second intermediate the hank is six and at the fine frame, 24 hank. Watch the build of the bobbins, the lay, twist and tension. Also keep a sharp watch on double and single, also bunches. Sometimes the slubber and first intermediate top leather rolls are varnished, the varnish used being a little lighter than that used for drawing frames.

THE ROVING

is spun into 100s from the 20-hank roving on a warp frame having 1⅜-inch diameter ring, 5-inch traverse, and spindle speed of 9,400 revolutions per minute. This yarn is then spooled, warped and put through the slasher, at which the following size may be used: 100 gallons of water; 75 pounds potato starch; 7 pounds tallow; 3 pounds Yorkshire gum; 2 pounds white soap; Boil two hours and let stand 10 hours before using. Keep agitator running and size almost at boiling point.

The 24-hank roving is made into 120s yarn on the mule.

Dyeing Particulars.

PINK.

One-half per cent rose B D; 1 per cent sal soda; 10 per cent salt.

SKY BLUE.

One-quarter per cent diamine sky blue F F; 1 per cent sal soda; 10 per cent salt.

CREAM.

Two grains diamine catechine 3 G; 1 per cent sal soda; 10 per cent salt.

ECRU.

Two per cent diamine catechine 3 G; ¼ ounce diamine fast yellow B; 1 per cent sal soda; 10 per cent salt.

PEA GREEN.

Two ounces diamine green B; 1 per cent sal soda; 10 per cent salt.

RED.

Five per cent diamine fast red F; 2 per cent sal soda; 20 per cent salt.

SAGE GREEN.

One per cent diamine green G; 1 per cent sal soda; 15 per cent salt.

WINE.

Four per cent diamine Bordeaux B; 2 per cent sal soda; 25 per cent salt.

SCARLET.

Three per cent diamine scarlet B; 2 per cent sal soda; 25 per cent salt.

ROYAL BLUE.

Five per cent diamine sky blue; 2 per cent sal soda; 25 per cent salt.

ROBES.

A cotton fabric with an unglazed surface, printed on one side, in highly colored patterns, this fabric is made up into robes, wrappers or gowns, hence the name. The fabric was originally produced in cashmere effects, and used primarily as a dress fabric.

This fabric, however, resembles in point of texture and general appearance the cloth known as "cretonne," which is also a printed cloth, but used principally for furniture coverings, curtains, comfortables and such purposes. The term robes is applied to both twilled and plain woven fabrics. The fabric used for robes is usually made from a 64-square printing cloth, or its equivalent, while the fabric used for household purposes is made from various textures.

The

CHARACTER OF PATTERNS

for robes is almost without limit, but the scale, or size of the figure in the design, however, should not be too large, as the numerous folds would destroy the effect of the repeat of the design. The designs best suited for this class of goods are small floral or geometrical figures, distributed in such a manner that they will not appear in the finished garment in rows or lines, but rather in an all-over effect, so that the various figures constituting the design may be seen at a glance.

THE COLORINGS

may be almost any conceivable com-

bination imaginable, providing of course that there be harmony in the colors used. The number of colors used varies from 4 to 10 different shades, the darker colors usually forming the background, while the lighter and brighter colors form the figures.

In regard to the construction for these fabrics the designer has little in the way of ingenuity, the important feature of the goods depending on the printing machine.

The fabric is composed of plain cotton yarn with

THE COUNTS

varying very little, a common texture being 64 ends and 64 picks, of 1-30s both warp and filling, sometimes arranged 70 ends and 58 picks, another texture being made with 64 ends and 48 picks, 1-30s warp and 1-26s filling, made in widths from 27 to 36 inches.

The goods are woven on high speed looms. The Northrop loom is well adapted for this class of goods. The cost of weaving is an important consideration in the production of these goods, as the retail price does not warrant an unnecessary expense.

FINISHING.

The goods, after being woven, are prepared for the printer by boiling off, then passed over heated cylinders to dry, after which they are ready for printing. After the printing process they are ready for the merchant.

Carding and Spinning Particulars.

The yarns to make robes are manufactured in the first division of mills as given in a previous article. The mixture for this cloth varies according to the mill making the goods and also the quality of the goods required of the manufacturer. Generally speaking, there is a certain percentage of waste used for this class of goods, and not only the percentage differs, but the quality of the waste used also. Some mills will use only comber waste, and other mills only comber and card waste, while other mills will use any kind of waste they can obtain, and run it through. The mixing plays an important part and the percentage of waste put in varies from 10 to 100 per cent. Production and plenty of it is the cry of the owners making this class of goods. This being the case, quality is somewhat lacking. To make up for this, the goods are brushed, which has a twofold advantage. It gives a

NAP

to the goods, as well as hides the neps in the cloth. When good raw stock is used, the length of staple is very short, rarely being over seven-eighths of an inch in length. The counts for the sample of cloth under description are 30s for both warp and filling. The mixings are made, as before stated, large and with the proper proportion of waste mixed in. This is then run through three processes of pickers, first being run through an opener. This opener has a fan, which makes 165 revolutions and carries the cotton to the aprons of the breaker picker and leaves the cotton in an open, airy state. This lattice or apron carries the cotton to the feed rolls of the beater. This beater is of the two-bladed type and makes 1,500 revolutions per minute. The proper drafts should be maintained at both pickers, so that a hard lap will be made. There are several methods by which, it is claimed, the laps may be made and will run off smoothly and without licking, but as near as can be found out by experimenting, no one remedy will fill all conditions. Judgment at this point is needed. The weight of a full lap at the head end of the breaker picker should be about 16 ounces per yard. These laps are put up at the intermediate picker and doubled four into one. This picker is equipped with a two-bladed rigid type of beater and has a speed of 1,450 revolutions per minute.

THE TOTAL WEIGHT

of a lap from this machine is 37 pounds or a 10-ounce lap. These laps are put up at the finisher picker and doubled four into one. This picker has the same style of beater as the other two; the speed is, however, slightly reduced, being 1,375 revolutions per minute. The total weight of a lap is 39 pounds, or a 14½-ounce lap. In some mills they omit the intermediate process of pickers, using just the breaker and finisher, and for this class of goods would advise two processes of picking. The laps are put up at the card. For this class of work the draft of the card does not exceed 90 and very often is not more than 85. The card fillet used on both the doffer and cylinder, as well as the flats, is coarse. The general count used is No. 33 wire or No. 100s for cylinder and No. 35 or No. 120s count for the doffer and flats. The settings used for this class of work are similar to those given for indigo prints. The speed of the cylinder is 165 revolutions per minute; licker-in, 350 revolutions per minute; flats, one complete revolution every 50 minutes. The weight of the sliver is 65

grains per yard, and the production is from 850 to 1,000 pounds per week of 60 hours, according to the quality and quantity required.

THE CARD

for this class of work should be ground once a month and stripped twice a day, although in some instances the doffer is stripped a third time. The waste taken out should not exceed 8 per cent. After leaving the card the sliver is put through two processes of drawing, the doublings at the breaker being six into one, and at the finisher six into one. The weight of a yard of sliver is 75 grains. The speed of the front roll largely depends on the call for drawing, and the manner in which the room is balanced. As frequently happens, the drawing frame is the machine to get an increase in speed so as to keep up with the slubbers or cards, and to do so the speed of the front roll is increased. The speed varies from 325 to 450 revolutions per minute, according to requirements. As the drawing frame is the last machine that can really be said to even the silver, care should be taken to see that all stop-motions are in perfect working order, and that they act quickly so as to prevent an end passing through before the frame stops. Whole sets of drawing or card sliver should not be put up at the back of the frame, because it tends to make uneven yarn. If a size at the front be taken when the tops of a can are running through, it will be found to be heavier than the standard; the middle about the standard, and when the can is almost empty it will size light. If the cans are equipped with springs, it will help overcome this defect to a large extent, and it will also help to stop the "breaking back" of the ends.

THE DRAWING

is put up at the back of the slubber and made into .60-hank roving, after which it passes through two processes of fly frames and is made into 2-hank roving at the intermediate, and 6 at the fine frame. The proper lay of the roving on the bobbin is 14 rows per inch for the 2 hank, and 33 lays per inch for the 6 hank roving. Twist jack roving so that it will bear its own weight when put in the creels at the successive machines. Be particularly careful about single,double and bunches. Sizing should be accomplished at the picker as follows: Every finisher lap should be weighed and if the weight varies more than half a pound, either side of standard weight, it is put back to be run over again. The cards should be sized once a week. The drawing frame finisher should be sized four times a day, and a variation of two grains to the yard either side of standard should mean a change. The fine roving is sized once a day and there is no hard and fast rule for changing.

The 6-hank roving is spun into 30s warp yarn on the spinning frame, two into one, on a frame having a 1¾-inch diameter ring, 2¾-inch gauge of spindle, 6½-inch traverse, and a spindle speed of 10,000 revolutions per minute. As soft a twist as possible is used so that it will nap well. The yarn is next spooled and warped, and run through a slasher. The 6-hank roving for the filling yarn is spun into 30s filling at the mule, as it requires a soft twist, for reasons before stated. After being spun it is taken to the conditioning room and remains there until wanted for use.

Dyeing Particulars.

NAVY BLUE.

Ten per cent immedial indone blue 2 B; 10 per cent sulphide sodium; 4 per cent soda ash; 30 per cent salt.

GREEN.

Eight per cent immedial green G G; 8 per cent sulphide sodium; 4 per cent soda ash; 30 per cent salt.

RED.

Six per cent diamine fast red F; 2 per cent sal soda; 30 per cent Glauber's; aftertreat with 2 per cent fluoride of chrome.

YELLOW.

Five per cent immedial yellow G G; 5 per cent sulphide sodium; 30 per cent salt; 4 per cent soda ash.

OLIVE.

Four per cent immedial olive 3 G; 4 per cent sulphide sodium; 30 per cent salt; 3 per cent soda ash.

BROWN.

Five per cent immedial brown B; 5 per cent immedial cutch O; 10 per cent sulphide sodium; 4 per cent soda ash.

MYRTLE GREEN.

Eight per cent immedial dark green B; 8 per cent sodium sulphide; 4 per cent soda ash; 30 per cent salt.

ORANGE.

Ten per cent immedial orange C; 10 per cent sodium sulphide; 4 per cent soda ash; 30 per cent salt.

BORDEAUX.

Ten per cent immedial Bordeaux G;

10 per cent sodium sulphide; 4 per cent soda ash; 40 per cent salt.

SLATE.

One per cent immedial black N N; 2 per cent soda ash; 1 per cent sodium sulphide; 25 per cent salt.

ECRU.

One per cent immedial cutch G; ¼ per cent immedial yellow D; 2 per cent sodium sulphate; 25 per cent salt.

BLACK.

Six per cent immedial brilliant black 5 B V; 6 per cent sodium sulphide ; 4 per cent soda ash; 50 per cent salt.

BENGAL STRIPES.

Bengal stripes is a name given to a type of gingham consisting of white and colored stripes, alternately arranged in small effects in regular order, the colored yarn having been dyed with Bengal indigo.

They were originally made in Bengal, India, the home of some of the many species of the plant from which indigo is extracted, Indigo Fera, and derive their name from that fact. They differ from some other types of striped ginghams only in having colored warp yarns that have been dyed with Bengal indigo.

INDIGO

has been used as a dyestuff for hundreds of years and has attained a reputation for itself that is responsible for a continued call for indigo-dyed goods in the market, although similar appearing goods may be made much more cheaply with modern aniline dyes. Goods dyed with the latter possess more merit than most of the so-called indigo-dyed goods, the colors of which do not penetrate beyond the surface of the yarns.

Indigo dyeing, if done properly, requires more time than is now thought advisable or necessary to devote to any ordinary class of dyed goods and has been substituted to a very large extent by anilines. The amount of indigo used has been steadily growing less for a number of years, and it appears probable that there will be very little of it used in the commercial world a few years hence.

USES OF BENGAL STRIPES.

Bengal stripes are used principally for skirtings, aprons, etc. Fig. 1 is an illustration of a typical fabric, the analysis of which shows it to be an article that can be depended upon to wear well.

The warp yarns are arranged 8 of blue and 4 of white, alternately, the filling being all white. The white yarn in both warp and filling has been bleached before being woven. The blue warp yarn was dyed in the skein with Bengal indigo.

The fabric illustrated is practically a warp face cloth, the warp yarn

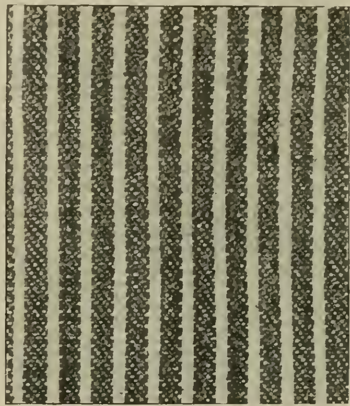


Fig. 1.

showing very prominently in alternate blue and white stripes, whereas the filling is almost hidden. Several factors tend to produce this effect, among which may be mentioned, first that two out of every three ends are raised on each pick, the weave being the 3-end warp flush twill to the left (Fig. 2);

Fig. 2.

second, that the warp yarns are harder twisted than the filling yarns and are approximately twice as heavy; third that the cloth contains considerably more ends than picks per inch.

ANALYSIS.

An analysis of the fabric shows the following construction data: Finished width, 29.7 inches; ends per inch, 67.2; picks per inch, 48; warp pattern, 8 blue and 4 white; warp counts, 9s; filling counts, 16s; yards per pound, 2.5.

Perhaps the simplest method of counting the number of ends per inch in a stripe pattern, and the most accurate, is to count the number of ends in each pattern; or if the latter is small, count several patterns on a given width and calculate accordingly.

For example, there are 12 ends per pattern in Fig. 1 and 7 patterns on 1¼ inches.

$$\frac{7 \text{ (ends)} \times 12 \text{ (patterns)}}{1.25 \text{ (inches)}} = 67.2 \text{ ends per inch.}$$

The greater the width measured and the number of patterns counted, the less the liability of error. When the full width of cloth is available for analysis purposes, it is advisable to measure and count the whole number of complete patterns, omitting sections of patterns and selvedges.

The layout of the entire warp is as follows:

White for selvedges.	White for ground.	Blue.			White.	Blue.
10 as 9				=	10	
		8				
	4		164 times	=	656	1,312
		8		=		8
10 as 9				=	10	
					676	1,320

676+1,320 = 1,996 ends in the warp.

The selvedge ends, with the exception of the two outer ends on each side, are drawn single. The two ends at each side are drawn together as one.

The entire 164 complete patterns in the above warp layout occupy 29¼ inches in the cloth.

$$\frac{12 \times 164}{29.25} = 67.2 \text{ ends per inch.}$$

LOOM REQUIRED.

These goods may be woven on single box cam or dobby looms, the former preferred. Six harnesses would be necessary if wire heddles were used on a dobby loom, whereas three twine harnesses would be sufficient. The ends are drawn in straight and the selvedges drawn the same as the ground yarns, one end through each heddle and three ends per dent.

FINISHING.

There is practically no finish given these goods, beyond burling, brushing and making up.

Carding and Spinning Particulars.

The yarns of which Bengal stripes are made are manufactured in mills of the first division as given in a previous article. The method of mixing the cotton in these mills would probably be by hand. In the up-to-date mills, however, openers are employed, especially if a large amount of cotton is used. The method generally used in such a case is to have several high-speed openers attached in a row the cotton being delivered on an endless apron, which carries it to a blower. This fan blows the cotton to the picker room to a condenser, which in turn deposits the open cotton upon an endless apron, which runs over the mixing bins. At every bin there is a chute which, when dropped, allows the cotton to be dropped into the bin.

AN IMPORTANT POINT

to look out for, when this method is used, is the danger of fire. By this method the cotton is thoroughly opened and may be used as fast as delivered, as it is in a loose, fluffy, dried-out condition. The number of openers used is according to the amount of cotton required by the mill. When this method is employed, the good sliver up to the slubber is put into the centre hopper. This insures a thorough and uniform mixing of this waste, which is always the "bugbear" of cotton mills. The stock used for Bengal stripes varies according to the quality of cloth desired, but generally a ⅞-inch to 1 inch staple is used. An opener and two processes of picking are used.

THE HOPPER

of the opener should be well filled and is connected directly with the breaker picker. The speed of this beater, which is of the three-bladed rigid type, is 1,400 revolutions per minute. In this breaker picker there are two beaters and two sets of cages. The forward beater is a two-bladed beater and the speed of this is also 1,400 revolutions per minute. The total weight of a lap at the front end is 40 pounds or a 20-ounce lap. The picker tenders generally allow this lap to be made as large as possible, but the weight per yard remains the same. These laps are put up at the finisher picker and doubled 4 into 1. This picker is equipped with either a two-bladed rigid or a pin beater; in either case the speed is 1,450 revolutions per minute. The total weight of the lap is 46 pounds net for a 52-yard lap, or about a 14⅛-ounce lap. This lap is put up

AT THE CARD,

the draft of which should not exceed 100. The speed of the cylinder should be 165 revolutions per minute; licker-in, 375 revolutions per minute, and flats one complete revolution every 45 minutes (110 flats). The fillet of the cylinder should be No. 33s wire or 100s and for the doffer and top flats No. 34s wire or 110s. The cards should be set and ground the same as given for indigo prints. The cards should be stripped three times a day of 10½ hours. The weight of the sliver per yard should be 55 grains and the production 900 pounds for a week of 60 hours. This sliver is put through two processes of drawing, six ends up at both the breaker and finisher drawing. The weight of the sliver is 75 grains at the finisher. The speed of the front roll is 400 revolutions per minute. The drawing should be sized

three times a day. For this class of work either metallic or leather covered top rolls may be used, but in either case should be looked after to see that they are in perfect condition. Watch the

STOP-MOTIONS

to see that they are in perfect working condition, and that the frame tenders do not block them up with cotton to keep them from working. The drawing sliver is now put up to the slubber, where it is made into .40-hank roving. Be careful to set the bottom steel rolls properly so as to obtain the best results, and watch the twist and tension. The slubber roving is made into 1 hank for warp and 1.20 hank for filling at the first intermediate and at the second or (in this case) the five frame is made into 2.25 hank for the warp and 3.50 for the filling yarn. These rovings are then taken to the spinning room and at the warp frame made into 9s on a frame having a 3¼-inch gauge, 2⅛-inch diameter ring and a 7-inch traverse. This is then spooled, warped and put through a slasher. The roving for filling is spun into 16s on a filling frame having a 6½ to 7-inch traverse, 1½-inch diameter ring and a 2¾-inch gauge. This yarn is then conditioned.

Dyeing Particulars.

BLUE.

Eight per cent immedial indogene G C L conc.; 10 per cent sulphide sodium; 4 per cent soda ash; 30 per cent Glauber's salt.

BLACK.

Ten per cent immedial black N R T; 10 per cent sulphide sodium; 4 per cent soda ash; 30 per cent Glauber's salt.

BROWN.

Five per cent immedial cutch O; 5 per cent immedial brown B R; 10 per cent sulphide sodium; 4 per cent soda ash; 30 per cent Glauber's salt.

OLIVE.

Five per cent immedial olive B; 5 per cent sulphide sodium; 25 per cent salt; 3 per cent soda ash.

DARK GREEN.

Ten per cent immedial dark green B; 10 per cent sulphide sodium; 30 per cent salt; 4 per cent soda ash.

MAROON.

Eight per cent immedial maroon B; 8 per cent sulphide sodium; 4 per cent soda ash; 30 per cent salt.

TURKEY RED.

Turkey red is a name given to fabrics that have been subjected to the Turkey red dyeing process. They are usually cloths constructed with the plain or small twill weaves, and are found in various widths. They are used for signal flags, dress goods and for many other purposes where a bright red color that will withstand severe tests of light, wear and weather is required. The analysis of two characteristic fabrics shows the following construction data:

Sample 1. Plain weave; 64 ends and 52 picks per inch; 30s yarn in both warp and filling. A fabric of this type could be woven on either automatic or ordinary plain cloth looms.

Sample 2. Three end twill weave, for ground; 66 ends and 72 picks per inch; 36s warp for the ground of the cloth, and 2-36s warp for the selvedges; 24s filling. The ground of this sample is drawn one end in each heddle and three ends in each dent. The selvedges weave two ply ends as one, 2 picks in each shed (Fig. 2), with catch thread on the outside, and are reeded 2 ends per dent. The two ply ends, as one, represent 4 single strands of yarn in each dent. There are 16 ply yarns in each selvedge.

Fig. 1.

Fig. 2.

It would be advisable to weave a fabric of this character on a dobby, in preference to a cam loom, because of the difference in weave of selvedges and ground. The former being on 4 and the latter on 3 picks necessitates 12 picks before they repeat together. Six harnesses would be required for the ground ends, and 3 for the selvedge ends, one of which would be for the catch thread.

CALCULATIONS.

In analyzing the twill fabric, a piece 2½ x 4 inches was found to weigh 12 grains, i. e., 10 square inches weigh 12 grains.

12 divided by 10 equals 1.2 grains per square inch.

The average number of the yarn was found as follows: 66 (ends) plus 72

(picks) equals 138 inches, which weigh 1.2 grains. 138 divided by 1.2 equals 115 inches per grain. 115 plus 10 per cent (for take up) equals 126 inches of yarn per grain. 126 times .2314 equals 29.1, say 29, average number.

By comparing the relative sizes of the yarns, warp and filling, by crossing and twisting them, it was found that 18 ends of warp were of the same diameter as 12 picks of filling.

Assuming the warp counts to be 36s, the filling counts were found as follows:

138 (sum of sley and pick) divided by 29 (average number) equals 4.76.

66 (sley or ends per inch) divided by 36 (warp number) equals 1.83; total 2.93.

72 (picks) divided by 2.93 equals 24.5, say 24, filling required.

Carding and Spinning Particulars.

The counts of the yarns of which Turkey red is made vary according to the quality desired. The stock being used also varies in length of staple and also grade. In one of the samples taken for this article the warp yarn is 1-36s and the filling yarn is 1-24s. For these yarns and quality of cloth the staple of the cotton used would be 15-16 of an inch in length and of a good grade.

THE MACHINERY USED

would be found in the second division of mills as given in a previous article.

All bales of cotton should be graded and sampled before being put into the mixing and all those not up to grade and length of staple should be placed one side and not used in the mixing. If the mill is up-to-date or of a recent construction the method of mixing would be as described in the last article. In older mills the cotton would be mixed by hand. If the latter method is employed, the mixing should be made from as many bales as possible and allowed to stand as long as possible to dry out.

PERIODS OF MIXING

of course vary according to the output of the mill in which the cloth is made. If space is plenty, which is not generally the case, a double mixing should be made, one mixing being used while the other is drying out, thus insuring that green cotton is not used. The cotton is then put through an opener and three processes of picking. The hopper of the opener should always be kept at least half full of cotton and the lifting apron should work easily and care should be taken to see that the slats are all whole. The pin beater should be adjusted so as to feed the proper amount of cotton to the breaker picker. This picker is generally of a combination type, having two sets of beaters and two sets of cages. The breaker beater speed is about 1,400 revolutions per minute, and is of a three-bladed, rigid type. The forward beater is generally of a two-bladed, rigid type, and its speed is 1,400 revolutions per minute. The

WEIGHT OF THE LAP

at this picker is 40 pounds, or a 16-ounce lap. These laps are put up at the intermediate picker and doubled 4 into 1. This machine has a single beater of two blades, rigid type, the speed of which is 1,425 revolutions per minute. The weight of lap at this machine is 38 pounds or a 12-ounce lap. These are put up at the finisher picker and doubled 4 into 1. The weight of a lap at the head end of this frame is 48 pounds or a 14½-ounce lap. In the picker room care should be taken to see that the drafts are properly regulated and that the eveners are working properly, and also that the cotton is thrown upon the top cage to help prevent splitting laps. Every lap should be weighed and a variation of one-half pound either side of standard weight is allowed. All laps varying over or under this allowance should be put back and run over again. Roving waste is mixed in the good cotton in many ways, one of which has been previously given. The laps are then put up at the card. At this machine the speed of the licker-in should be 375 revolutions per minute. The flats should make one complete revolution every 45 minutes. The wire fillet used should be No. 33 or 100 for cylinder and No. 35 or 120s for the doffer and top flats.

THE CARD SETTINGS

should be the same as given in a previous article on indigo prints. Strip three times a day for a 10½-hour day and grind at least once a month. Keep the flats free from fly and all quick motions well oiled, especially the main cylinder bearings, which, if not properly attended to, heat up and cause blistering. The draft of this card should be about 100; the weight of the sliver is 60 grains per yard and the production is 700 pounds for a week of 60 hours. Watch the wire fillet to keep it sharp. For this sample we will consider the yarns to be combed. When this is the case, the sliver is taken from the card and put through the sliver lap

machine, ribbon lap machine and the comber, or it may be taken from the card and put through a process of drawing, sliver lap and then to the comber. We will consider the former method. Here again a great deal depends on the size and make of comber being used. For this article we will take the older styles of six-head, 8¾-inch lap, combers. The weight of a yard of lap at the sliver lap machine (doublings being 14 into 1) would be 295 grains. At the ribbon lap machine the doublings would be 6 into 1, and the weight of lap 260 to 275 grains per yard. The laps are put up at the combers and doubled 6 into 1. The weight of the sliver is 48 grains per yard. Sixteen per cent of waste is taken out at the comber. The comber sliver is next put through two processes of

DRAWING FRAMES.

The weight of a yard of sliver at the finisher is 70 grains and the doublings 6 into 1 at each process. Size four times a day and don't skip a size. This sliver is put up at the slubber and made into .60 hank roving. For the warp yarn this is put through two processes of fly frames; at the first intermediate it is made into 2.25 hank and at the fine into 7.50 hank. This is taken to the ring frame and spun into 36s on a frame with a 2¾-inch gauge, 1 9-16-inch diameter ring, and a 6-inch traverse, the spindle speed being 9,600 revolutions per minute. The yarn is then taken and spooled, warped and slashed.

The slubber roving for the filling is also put through two processes of fly frames. At the first intermediate it is made into 2 hank and at the second into 5 hank, after which it is spun into 30s filling yarn on a frame with a 2¾-inch gauge, 1⅜-inch diameter ring, 6-inch traverse, and spindle speed of 7,350 revolutions per minute. This yarn is then taken and conditioned.

Dyeing Particulars.

The dyeing of Turkey red has been handed down from generation to generation for the last 500 years, and possibly long before that time. The city of Adrianople, and also the city of Salonica, were formerly famous for this celebrated color. It is not so ancient as indigo blue, because the clothes around mummies in Egypt 2,000 years B. C. have indigo colors on them. The original Turkey red was a process of long duration. Thirty days were often consumed before the finished cloth or yarn was produced.

The cloth was oiled in olive oil, dried, and hung up in long chambers for some days, to age the goods, and fix the oil in the fibre. The goods were then oiled again, and aged, the process being repeated several times.

The short process of Turkey red is to oil with a solution of Turkey red oil, 20 per cent, and then dry. Oil again and dry, and allow to remain for a few hours in that state, and pass through a solution of acetate of alumina at 6 degrees Tw. Dry in hot air and pass through a dunging bath of cow dung and bi-arseniate of soda. This process will take away the surplus mordant from the cloth, and fix the alumina in the fibre. The cloth is well washed in water, and then dyed with about 15 per cent alizarine red paste, 4 per cent bullock's blood, 1½ per cent nutgalls, and enough acetate of lime to correct the water.

The goods are dyed for one hour, and well rinsed, dried and passed through a solution of Turkey red oil, about 5 per cent, dried, and steamed for one hour. The goods are then well soaped in a strong bath of hot soap, and well rinsed, and finished as required.

LAMP WICKING.

Lamp wicking is usually constructed of coarse low-grade cotton yarns. There are three general forms or types: braid wicking, flat wicking and round, hose or tube wicking.

They are made in sizes varying from a small fraction of an inch, in the braid and flat types, for miners' and similar lamps, to several inches in width, in the flat and round types, for large oil lamps and stoves.

The principal objects sought to be secured in these goods are strength,

Fig. 1.

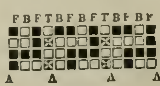


Fig. 2.

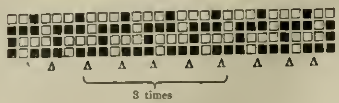


Fig. 3.

thickness and moisture-absorbing qualities.

BRAID WICKING.

This differs from a solid braid, as in braided rope and clothes lines, in having a core of very soft, coarse roving, around which have been braided finer yarns of a good strength and quality. There are 10 strands of roving for the core and 32 ends of fine 2-ply mercerized yarn for the braided covering. The latter imparts the requisite strength to the fabric, while the other desirable qualities are furnished by the roving. This wick is so constructed that the core could be withdrawn without interfering with the construction of the covering, There are about 72 yards per pound.

FLAT WICKING.

There are three methods adopted for making heavy, thick fabrics: First, by means of coarse yarns; second, by means of compound structures of cloth; third, by combining the first and second methods.

Flat lamp wicking requires an extra large surface, one deeper than can ordinarily be obtained by using coarse yarns in a single weave structure. It is usually woven with coarse warp yarns and comparatively fine, strong filling yarns, with double plain weaves of equal structure arranged 1 and 1 in both warp and filling, the two single fabrics being bound together into one compound fabric by other yarns, termed ties or binders, which interlace with both with more or less frequency. Where as firm a structure as is possible is wanted, the ties are arranged as extras to work the single plain weave, as shown by the crosses in Fig. 1. This entire figure is the base weave upon which the design for this wicking has been constructed. Ends 1 to 4, repeated, would form a tube or hose pipe fabric, the picks going first into one cloth and then the other on alternate picks. Solid type shows the face weave, type ◻ the back weave, type face ends raised when back picks are inserted. Back ends are depressed on picks 1 and 3, when face picks are inserted. The complete weave is shown in Fig. 2, and is on 38 ends and 4 picks. Letter F indicates face ends. B indicates back ends. T indicates ties. The arrows indicate where the ends are divided by the reed, eight dents being used.

The construction data of this wicking is as follows: Warp, 2-ply 5s cotton; filling, 2-ply 15s cotton; width, ⅝ inch; ends in wick, 38, of which seven are ties; picks per inch, 18½. The warp contains very little twist in the single strands and only five turns per inch in the ply yarn. There are not any selvedges such as are usually made on other types of goods.

ROUND, HOSE OR TUBE WICKING.

This wicking has been made with weave Fig. 3, with two ends working together as one. An examination of this will show that it is constructed on the same principle as the first four ends of Fig. 1, the two cloths being tied only at the sides where the filling changes from interlacing with one series of ends to the other series every pick. The arrows indicate where the ends are reeded. The two outer dents on each side contain only four ends each, whereas the remainder of the warp is reeded six ends (3 doubles) per dent

The construction of this wicking is as follows: Warp, 2-ply 5s cotton soft twisted; filling, 3-ply 15s cotton; width, 1⅜ inches; ends in wick, 106 as 53; picks per inch, 28; yards per pound, 15. The warp yarns are arranged 52 ends of white and 1 of blue, repeated once.

LOOM REQUIRED.

For braid wicking a braiding machine is required. For flat and round wicking, narrow ware cam looms, varying in construction according to the weight and width of wicking to be woven, are used.

For the narrow wicking an ordinary tape loom may be used, in which each wicking has its separate warp or warps. The warps for wide wicking are usually run on wide beams, and the yarn divided in the loom. In order to make a soft wicking on these the tying ends are run from a beam as in an ordinary loom. The other yarns are run from one or two separate beams, and are regulated by an attachment which draws them forward in a positive manner in order to avoid the strain usually caused when the yarn has to draw the beam forward.

Each of the fabrics under consideration has been woven from one beam. In the flat wicking the plain ends work tighter than the other ends on account of the larger number of interlacings. This causes them to sink below the plane occupied by the double cloth ends and also causes the latter to be and appear somewhat loose.

FINISHING.

There is practically no finishing given these goods, as they are simply cut into definite lengths and packed, after being woven. The yarn for some of the wicking is bleached or dyed before being woven. Where colored yarns are used, they are usually arranged in the warp to make a striped fabric.

Carding and Spinning Particulars.

Manufacturers of wicking generally buy their yarns from cotton yarn

mills and it is in this latter class of mills that coarse and fine counts of yarns are made. Generally speaking, the so-called yarn mills do not belong to any of the divisions of mills given in a previous article, but are rather in a class or division by themselves, being ready and equipped to fill orders for all counts of yarn, either carded or combed. Of course there are yarn mills making a specialty of fine yarns, but, generally speaking, this class of mills make yarn for the knitting trade, which as a rule does not call for as high counts of yarn as a fine goods mill.

In this class of mills a great many

MORE CHANGES

are made than in mills making cloth, some of the latter mills' card rooms running from one year's end to the next without a change in the hank roving or stock, whereas in the yarn mills changes are made daily. This is on account of filling the orders for small knitting plants, of which there are a great number throughout the country. Generally speaking, more care has to be used in a yarn mill than in a cloth mill, both on account of the many changes and also on account of the yarn being sold and not woven in the same mill, where the smaller defects may be covered. Of course, in both mills the yarn should run as even as possible, but this fault should be looked after particularly in yarn mills. In yarn mills

THE TWIST

of the yarn is less than in cloth mills, and this class ot mills is generally equipped with mules instead of spinning frames to obtain this result. Particular care should be taken in yarn mills to see that no "mix-ups" occur in any part of the card room on account of the carelessness of those changing the gears, and it is a good idea to have specially prepared forms to be filled out when each change is made at the slubbers, fly frames and mules or spinning frames. After these forms are made out by the one making the change, they should be handed in and checked by the overseer.

For making the tube wicking, the counts of the yarn are as follows: 2-ply 5s warp soft twist and 3-ply 15s regular twist, while the filiing or centre portion or core is made up of 2-ply 1 hank roving. These counts of yarn are all made from the same

STAPLE AND GRADE

of cotton, generally cotton from ⅞ to 1 inch in staple of a good grade being used. In large mills an opening shed is built and the cotton is opened and fed to the opener hoppers or feeders, several being placed in a row and from here blown over to the mill proper, where it is received and carried by arrangements of endless belts to its proper bins. When the cotton is thus opened it is in a dry, fluffy state and may be used at once and does not have to stand, as is the case when the cotton is mixed by the hand method, which has been previously described.

The cotton is put through a feeder and three processes of pickers. The feeder picker should always be kept filled up with cotton, so that the lifting apron will always be filled up. The breaker beater is equipped with two sets of cages and two beaters. The breaker beater has three arms and blades, and its speed is 1,400 revolutions per minute.

THE FRONT BEATER

has two blades and its speed is also 1,400 revolutions per minute, but it must be remembered that the cotton does not receive as much beating as it does at the three-bladed beater,on account of having one less blade. The weight of a yard of lap at the machine is 16 ounces. On the breaker picker there is no evener and the amount of cotton fed is regulated by the distance of the pin or stripping beater from the lifting apron. The laps from this machine are put up and doubled 4 into 1 at the intermediate picker.

This picker is generally equipped with a two-bladed beater, its speed being 1,400 revolutions per minute. The weight of a yard of lap at the front is 12 ounces. This picker has an evener, which should be looked after carefully to see that it is doing its duty. The laps from this picker are put up at the

FINISHER PICKER,

and doubled 4 into 1. This picker may be equipped with either a two-bladed rigid beater or a pin beater which has three arms equipped with pins. If the latter beater is used, the speed for this style should be 1,400 revolutions per minute. The weight of a 50-yard lap should be 46 pounds or a 14.7-ounce per yard lap.

Every lap should be weighed and a variation of one-half a pound either side of standard allowed. All laps which vary more than this should be put back to be run over again. Care should be taken to see that every lap is weighed, and if laps do not weigh within the limit, the evener should be

adjusted to allow the next lap to come within this weight limit. These laps are put up at the card, the draft of which should not exceed 100. The speed of the flats should be one revolution every 40 minutes (110 flats); the speed of the licker-in 300 revolutions per minute and the doffer about 13½ revolutions per minute. The general instruction for settings, grinding and stripping given previously may be followed. The

PRODUCTION OF A CARD

for 60 hours for this class of work is 850 pounds and the weight of the sliver 65 grains per yard. If the yarn is combed, it passes through the sliver lap machine, where it is doubled 16 into 1 for an 8¾-inch lap, the weight per yard being 420 grains. These laps are put up at the ribbon lap machine and doubled 6 into 1. The weight of a yard of lap at this machine is 440 grains for a 10½-inch lap. The ribbon lap machines should be sized twice a day and a variation of seven grains per yard allowed before changing the draft gear. These laps are put up on an 8-head comber and doubled 8 into 1. The weight of a yard of sliver at the delivery end of this machine should be about 65 grains per yard.

THE SAME SETTINGS

and timing for this machine may be used as have been given previously for a 6-head, 8¾-inch lap comber of the Heilman type of combers. The percentage of waste taken out is 18. This sliver is then put through two processes of drawing, the weight at the finisher drawing being 70 grains per yard. If the cotton is not combed, three processes of drawing frames are used, the weight of the sliver being the same as when combed. Size drawing four times a day, allowing two grains either side of standard weight. The drawing sliver is next put through the slubber and made into .40 hank roving. From here it is passed to the first intermediate fly frame and made into 1 hank roving. The roving for the core is twisted slightly more than that used for the warp and filling yarns, generally 1 or 2 less teeth used on the twist gear being sufficient. The roving for the core is then twisted into 2-ply. For the warp yarn the yarn is soft spun at the mule into 5s yarn and then twisted into 2-ply yarn. For the filling yarn the first intermediate roving requires one more process of fly frames, which makes it into 3-hank roving. This is taken either to the mule room or the spinning room and spun into 15s, after which it is twisted, being made into 2-ply 15s yarn.

The rules and instructions for the top rolls given in previous articles may also be applied to this article.

EOLIENNE.

Eolienne is the name applied to a fine dress fabric characterized by having the filling of a much coarser count than the warp, and in consequence producing a corded effect across the breadth of the goods. This class of goods is made up of a raw silk warp and either cotton or worsted filling, with the warp ends per inch greatly in excess of picks per inch.

In fabrics constructed on this basis

THE WARP THREADS

practically cover the filling and produce—with a silk warp—a very glossy fabric, another feature of an eolienne.

This fabric finds favor with the feminine sex practically the year around, being very popular for dressy indoor occasions in the cooler periods of the year, as well as dressy outdoor wear for summer.

The goods are made up in the gray, then dyed in the piece, in any color that the trade desires. The darker shades find most favor for fall and winter use, while the lighter shades are preferred for summer wear. Eolienne

VARIES IN WIDTH.

The cotton filling fabric finishes at 27 inches, while the better grade worsted filling finishes at 40 inches and retails at from 85 cents to $1.25 per yard and the narrow cotton filling fabric retails at from 25 to 45 cents per yard. The variation in price is naturally influenced by the material in the goods, that is, the ends and picks per inch, consequently we find a comparatively wide range in the construction of these fabrics. The manufacturer, however, must bear in mind that the fabrics should be perfectly firm in order to withstand the wear of a dress fabric.

PLAIN WOVEN FABRICS

lend themselves more readily to a variation in texture with a given count of yarns than does any other method of interlacing warp and filling threads, this being due to plain woven fabrics having more intersections to the repeat of the weave than any other weave.

In varying the texture, we must bear in mind the nature of the material to

be used, as certain kinds of yarns require less ends per inch than others of a given count to produce a firm fabric. In the construction of an eolienne which is made up of a silk warp, silk, being the smoothest of textile fibres, would require more threads per inch than a fabric composed of woolen fibres, as the silk threads will not cling to one another or full up in the finishing as would a fabric composed of woolen fibres; consequently silk warp fabrics usually have a very high warp texture.

ANALYSIS.

Cotton filling fabrics: Width of warp in reed, 30 inches; width of fabric finished, 28 inches; ends per inch in reed, 90; ends per inch, finished, 96.

Reed, 45x2.

Silk warp, 21-23s dennier silk; cotton filling, 2-50s combed cotton; 58 picks.

WORSTED FILLING EOLIENNE.

Width of warp in reed, 44 inches; width of fabric, finished, 40 inches; ends per inch in reed, 150; ends per inch, finished, 166.

Reed, 50x3.

Silk warp, 21-23s dennier silk; total number of ends in warp, 6,600; 40 ends additional each side for selvedge, 80; total, 6,680 ends.

Worsted filling, 1-50s French spun; picks per inch, 64.

These fabrics may be woven on any light, smooth running roller or dobby loom. The warp is drawn straight on eight harnesses through French string heddles. The speed of the loom may with advantage run from 130 to 140 picks per minute.

FINISHING.

Eolienne requires little in this respect. After the goods reach the dye house, they are boiled off, then dyed as desired, run through the rotary press and made up into laps or rolls of about 40-yard pieces. Then they are ready for the commission house.

Carding and Spinning Particulars.

The yarns for eolienne are made in mills of the third division as given in a previous article. The count of yarn taken for an example of this class of goods is 2-50s cotton filling, the warp yarns being made of raw silk. In this article we will give the foundation for making this count of yarn for this class of goods. While the count of yarn is not what would be called a fine one, still the general construction of the goods calls for a fairly good length of staple of a good grade of cotton, sometimes the yarns being mercerized and gassed. The sample calls for a cotton of good grade of from 1½ inch to 1 9-16 inch staple. This cotton is put through two processes of picking, the speed of the beaters being 1,500 and 1,250 revolutions per minute, respectively,for the beater and finisher. The weight of the lap at the finisher should be 37½ pounds, or a 12-ounce lap. The card should be equipped with 35s wire fillet for the cylinder and 37s for doffer and flats. The speed of the licker-in should not exceed 300 revolutions per minute; the speed of the flats, one complete revolution every 40 minutes, and about 9½ per cent of dirt, strip, etc., taken out. Strip three times a day and grind as before stated.

SETTINGS

should be close. Special attention should be paid to the licker-in, both as regards its speed and also as to its setting. The feed plate should be set far enough away not to break the staple and not so far as to allow the licker-in to continuously draw bunches into the cylinder. The draft should be about 110 and the weight of the sliver 55 grains per yard. The production should not exceed 525 pounds for a week of 60 hours. The cotton sliver is next put through a sliver lap machine, the doublings for an 8¾-inch lap being 16 into 1, the weight being 400 grains per yard. These laps are put up at the ribbon lap machine and doubled 6 into 1, and made into a lap on a 10½-inch spool. The weight of this lap should be about 420 grains. These are put up at the comber and doubled 8 into 1. For the Heilman machine the end cam should be set as follows: with the 80-tooth gear out of mesh, set roller on pawl arm in heel of large cam, turn index gear to 5½ and slide 80-tooth gear into mesh and bolt. Set detaching rolls to fluted segment with 21 gauge. Set nippers to open at 3½ index gear and close at 9¼. Set lifters down at 6¾ and up at 8¾ to 9; top combs down at 5; detaching rolls beginning to move at 6 and feed roll at 4, or according to amount of waste to be taken out. Set cushion plate to half lap with an 18 gauge and top combs to fluted segment with a 21 gauge. Use a 15-16-inch stock gauge. Use a 30-degree angle on nipper knife. For this stock take out 18 to 20 per cent waste. The weight of the sliver delivered is 60 grains per yard. Speed of comber is 100 nips per minute.

The sliver is next put through

TWO PROCESSES

of drawing frames. For this class of goods use a front roller speed of 350

and have leather top rolls well varnished and see that all stop-motions work properly.

Weight of sliver at finisher drawing frame is 70 grains per yard. At the slubber make .55 hank roving and use three processes of fly frames, the hank roving at each being 1.25 at first; 4 at second, and 10½ at fine frame. Spin the roving into 50s, on a ring frame, with a 2¾-inch spindle gauge, 1¼-inch diamond ring and a 5-inch traverse. If mercerized yarn is wanted, spin with a soft twist, otherwise use the regular cloth twist, which for this yarn would be as follows: twist per inch, 22.98; revolutions per minute of front roller, 100 plus; revolutions per minute of spindle, 7,250. After which the yarn goes through the usual processes to be twisted into 2-ply 50s.

Dyeing Particulars.

PINK.

One-quarter per cent Erika pink G; 1 per cent sal soda; 10 per cent Glauber's salt.

LIGHT BLUE.

One-half per cent diamine S K blue; 1 per cent sal soda; 10 per cent Glauber's salt.

OLIVE.

Two per cent diamine green G; ½ per cent diamine fast yellow B; ¼ per cent diamine brown B; 1 per cent sal soda; 20 per cent Glauber's.

HELIOTROPE.

Two per cent diamine heliotrope; 1 per cent sal soda; 20 per cent Glauber's salt.

NAVY BLUE.

Eight per cent immedial indigo B; 8 per cent sulphide sodium; 5 per cent soda; 20 per cent Glauber's.

MYRTLE.

Eight per cent immedial deep green B; 8 per cent sulphide sodium; 5 per cent soda ash; 30 per cent Glauber's.

FAWN BROWN.

One per cent diamine brown B; ½ per cent diamine fast yellow B; ½ per cent sal soda; 20 per cent Glauber's.

SEAL BROWN.

Four per cent diamine brown B; 1 per cent diamine fast yellow B; 1 per cent diamine catechine B; ½ per cent sal soda; 30 per cent salt.

BLACK.

Ten per cent immedial black N N; 10 per cent sulphide of sodium; 30 per cent Glauber's salt; 5 per cent soda ash.

SAGE GREEN.

One-half per cent diamine green G; 1 per cent sal soda; 30 per cent salt.

PEARL.

One-sixteenth per cent diamine dark blue G; 1 per cent sal soda; 20 per cent Glauber's.

SLATE.

One per cent diamineral black B; 1 per cent sal soda; 20 per cent Glauber's.

HANDKERCHIEFS.

Cotton handkerchiefs are constructed in various ways. Some are made from ordinary plain cotton cloth cut up and either hemmed, embroidered (usually with initials) or ornamented with Battenburg or other forms of lace. Others are what may be termed "made in the loom," and are of such types as hemstitched, in which a leno weave is used for the four borders to make a perforated effect, and corded handkerchiefs, in which corded effects are made for both the side and cross borders.

They vary in size, weight and quality, from the utilitarian red bandanna to the ladies' dainty ornamental lace article.

In a characteristic handkerchief of the cord type, the layout of the entire warp, including the drawing-in draft, is as follows:

	Ends.	Harness.		Dents.
Selvedge	32 as 16	1 2		8
	32	3 4 5 6		16
Border	10 as 2	7 8		2
	6	3 4 5 6		3
	10 as 2	7 8		2
	6	5 6 3 4		3
	10 as 2	7 8		2
	14	3 4 5 6		7
	40 as 8	7 8		8
	14	5 6 3 4		7
	10 as 2	7 8		2
	6	3 4 5 6		3
	10 as 2	7 8		2
	6	5 6 3 4		3
	10 as 2	7 8		2
Body	1080	3 4 5 6		540
	152	Draw border		46
	56	3 4 5 6		28
			Skip	1
	56	3 4 5 6		28
	152	Draw border		46
	1080	Draw body		540
	152	Draw border		46
	32	3 4 5 6		16
Selvedge	32 as 16	1 2		8
	3008 ends			1369

From the above layout it will be seen that two handkerchiefs are woven in the loom at the same time, side by side, one empty dent separating them, and that one beam only has been used. Each warp cord border consists of 100 ends working as 20.

THE SAME EFFECT

could be obtained by using a coarser

yarn, but the probabilities are that if this was done it would become necessary to use two beams. Twenty-eight dents have been occupied between the cords and centre empty dent to allow ample width for turning the edges under for hemming purposes.

The construction data of this handkerchief are as follows: Warp counts, 32s; filling counts, 40s; ends per inch, 72 in plain part, 79 average; picks per inch, 70 in plain part, 77 average; ends in handkerchief, 1,504; picks in handkerchief, 1,454; width in loom, 40 inches; width in gray, 38 inches; weight, 4.5 yards per pound.

One of the principal points to consider in handkerchief weaving is the arrangement of the chain draft for the filling pattern and loom mechanism so that there will not be any more bars of pattern chain used than is necessary.

THE FILLING PATTERN

of the handkerchief under consideration contains 1,454 picks. On an ordinary dobby head this would require 727 bars of double index, or 1,454 bars of single index chain. To avoid this excessive amount of chain there are several devices or loom attachments now on the market, comprising double or more cylinder repeater, multiplier, or handkerchief motions.

Most of these require separate chain bars for the two borders and a certain number of bars for the plain, varying according to the type of motion used.

Fig. 1 shows the chain draft that has been used to produce the handkerchief referred to, with the layout shown; 86 double-index bars have been used for each handkerchief, one for the plain in centre and borders, and 85 for the cord cross borders, with a repeat motion that is not on the market. The selvedges have been woven plain. The harnesses for these have not been indicated on the chain draft, because they are worked in a positive manner by the lifter knives.

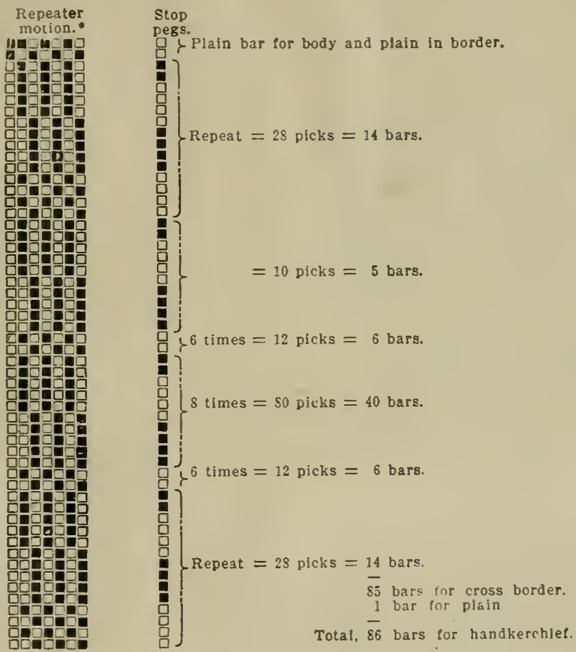


Fig. 1.

LOOM REQUIRED.

The handkerchief was woven in a single box dobby loom from one beam. It might at first thought appear to be an advantage to weave cross borders of this type with coarse filling in a 2x1 box loom, using one pick of coarse instead of five picks of fine filling, but the lower speed at which it is necessary to run box looms and the more attention they require from weaver

* Repeater motion refers only to left-hand vertical series of squares.

and loom fixer, lessen this seeming advantage. Single box cam looms, with handkerchief motions attached, in which sliding cams work the plain weave or remain in an open-shed position for a number of picks as required, are sometimes used. These admit of a much greater speed and steadier motion than dobby looms.

FINISHING.

Cord handkerchiefs are usually bleached, cut, hemmed, folded, pressed and made up as required. Plain cloth handkerchiefs are similarly treated or are printed, usually red and white or blue and white, instead of being bleached.

Carding and Spinning Particulars.

The yarns that compose handkerchiefs are made in mills of the second and third divisions, as given in a previous article. Generally speaking, handkerchief yarns are combed, even the coarser yarns for the poorer quality of handkerchiefs. The handkerchief taken for a sample is made up of 32s warp yarns and 40s filling yarns, and it is often found that a different count of yarn is used in the cords.

For the sample under description, a good quality of American cotton of about 1 5-16 to 1⅜ staple would be used. This would be mixed, as has been before described,

MACHINE MIXING

being used if possible, as it leaves the cotton in a more desirable condition. An opener and three processes of picking are used, although in some fine cloth mills only two processes of picking are used, and excellent results obtained. Some overseers consider that an intermediate picker is not necessary, and, in fact, claim that instead of benefiting the cotton, it is a detriment, as it puts neps into the cotton. While this may be true, good results are obtained by either process, and one has to be governed by circumstances as he finds them, as it very often happens in a cotton mill that no hard and fast rule can be given, the object being to get a good clean, even yarn with strength, and on the mark as to count, and also to get as much as possible as cheap as possible. At the feeder have it feeding as even as possible and remember that on the pin roller

DEPENDS THE EVENNESS

of the lap at the breaker. The breaker is equipped with two sets of cages and beaters, the breaker beater having three blades, and making 1,400 revolutions per minute, while the front beater has two blades, and also makes 1,400 revolutions per minute. It will thus be seen that the cotton passing under the three-bladed beater receives one-third more beating than when passing under the forward beater of the same machine. A full lap should weigh 40 pounds, or a 16-ounce lap. If three processes of pickers are used, these laps are doubled 4 into 1 at the intermediate picker. The total weight of a lap at this machine should be 38 pounds, or a 14-ounce lap. At the finisher picker the doublings are also 4 into 1. The speed of a beater of this picker is 1,425, if equipped with a pin beater, and 1,450 if a two-bladed rigid type is used. The total

WEIGHT

of a lap is 37½ pounds for a 40-yard lap, or a 15-ounce lap. All the laps as they are taken off the picker should be weighed, a variation of one-half a pound either side of the standard weight being allowed. The roving waste (cut) should be mixed as before stated, or better still if it is run through a special roving machine, and then put back into the mixing. In this manner scarcely any "lickin" laps are made, granted, of course, that too much cut waste is not being made, or too little cotton being used. Cut roving waste and also card, sliver lap, ribbon lap, comber and drawing frame good waste is a serious problem, and it should not be allowed to accumulate, but should be used up as fast as made. The laps are put up

AT THE CARD.

This card is, generally speaking, the so-called English card. It should have as large a doffer as possible, either a 26 or 27 inch diameter being used by mill men nowadays. The size of wire fillet used should be that used for making medium counts of yarn, i. e., No. 34 or 110s for cylinder, and No. 36s or 130s for doffer and flats. The draft of the card should not be less than 110. The speed of the licker-in should be about 400 revolutions per minute. The flats should make one complete revolution every 40 minutes. Strip, grind and set as given in previous articles. The production of the card for a week of 60 hours should be 600 pounds. If this yarn is to be combed, it is generally run through the sliver lap machine, where it is doubled 14 into 1, and weighs 250 grains

per yard for an 8¾-inch lap, after which it is put up at the ribbon lap machine and doubled 6 into 1, the weight of a yard of lap at the front being 275 grains. These laps should be

SIZED TWICE A DAY,

a variation of 5 grains per yard either side of the standard weight being allowed before changing. At the comber use the same settings, timings and gauges as given in the last article. The combed sliver should weight 45 grains for a 6-head comber, and proportionately more for an 8-head comber. For these goods about 15 per cent of waste is taken out. Watch the needles on the half laps and top combs, for remember that if these are broken or bent,the cotton is not receiving its proper combing, and as this is an extra item in the cost, these little points should be looked after. Another part of the comber to watch is the table, to keep it free from dirt and oil, and well polished and smooth at all times. This is because after leaving the comber the cotton receives no more cleaning, so that dirt even in the sliver is apt to stay there.

PERCENTAGES OF THE COMBER

should be taken frequently and all comber percentages kept as even as possible, for if there is much variation it will show up and make uneven yarn. Another point to watch is the leather top rolls. These should be kept well varnished, with a varnish which will last at least three weeks, although the detaching rolls should be given one coat of varnish every week. Varnish should be applied with a brush. At the drawing frame, the comber sliver is put through two processes, the doublings being 8 into 1 at the breaker, and 6 into 1 at the finisher. The weight per yard at the finisher drawing frame is 70 grains per yard. At this machine

THE MAIN POINTS

to watch are the knock-off motions, roller settings and top rolls. For drawing frame top leather rolls a varnish should be used which is smoother and glossier than that used for the comber rolls. Usually this is obtained by using Venetian red, instead of burnt sienna, as a color mixing. At the slubber, the drawing is made up into .60 hank roving. Watch the twist and tension. If top leather rolls are varnished, the same varnish as is used for the drawing frame may be used, except for the fact that it is thinned down by adding acetic acid or vinegar. The roving is then put through two processes of fly frames. At the first intermediate it is made into 2 hank, and at the fine it is made into 6½ for warp, and 8 hank for filling. At these frames watch the following parts: tension, twist, setting of steel rolls, traverse and roving waste. Be sure to have no dead spindles. The

YARN FOR THE FILLING

is spun into 40s on a frame with a 1⅜-inch diameter ring, 5½-inch traverse, and a spindle speed of 8,800 revolutions per minute, after which the filling is conditioned, and is then ready for weaving. The roving for warp is spun into 32s, on a frame with 2¾-inch gauge, 1⅝-inch diameter ring, and spindle speed of 10,000 revolutions per minute. The yarn is then spooled, warped and put through a slasher, and run upon a beam at the front. Generally speaking, this beam is made up of sections of small beams known as handkerchief beams, on which are wound the required number of ends.

DIAPER CLOTH.

Cotton diaper cloth may be considered a staple fabric, being made in the same widths, grades and patterns year in and year out.

Standard widths are 18 inches, 20 inches, 22 inches, 24 inches and 27 inches.

Essential qualities required for these goods are freedom from foreign matter, and ability to absorb mois-

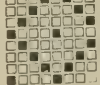


Fig. 1.

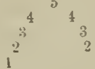


Fig. 2.

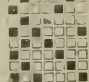


Fig 3.

ture. Being subjected to excessive washings when in use, they have to be of fair quality.

For the ordinary qualities of goods, Allen Seed. Benders, Mobile, New Orleans and Texas cotton of middling and strict middling grades are used. In the lower qualities, card and roving waste is used for the filling.

CONSTRUCTION.

A diaper fabric under consideration

is constructed as follows: Width, 18¾ inches, probably intended for 18 inches; ends per inch, 62; picks per inch, 46; warp counts, 30s; filling counts, 14s; weight, 7.83 yards per pound; weave, Fig. 1. The selvedges consist of 24 ends of 30s as 12 on each side, and have been reeded 4 ends per dent; they weave plain. The body of the cloth has been reeded two ends per dent.

The combination of a filling flush weave, only one end out of 4 being up on each pick, and a soft, coarse filling as compared to the warp, tends to make the face of the cloth very soft. This is aided by the finishing process, which renders the fabric absorbent to a large degree, as well as antiseptic.

Fig. 2 shows the centre or point harness draft, and Fig. 3 the chain draft, to use to produce the fabric under consideration. As harness number 5 works like harness number 1, it might be omitted, and the ends drawn on number 1 instead.

If the ends were drawn in straight, the chain draft would be similar to the weave, with selvedges extra.

CALCULATIONS.

$$\frac{46 \text{ (picks) x } 20 \text{ (width in reed) x } 100 \text{ (length of cut)}}{14 \text{ (counts) x } 840} = 7.82 \text{ lbs. filling.}$$

100 (yds.) divided by 7.83 (yds. per pound) = 12.77 lbs. weight of cut.

12.77 — 7.82 = 4.95 lbs. warp.

18¾ (width of cloth) x 62 sley = 1,162.

1,162 + 24 for selvedges = 1,186, total ends.

$$\frac{1{,}186 \text{ (ends) x } 105 \text{ (length)}}{4.95 \text{ (weight) x } 840} = 30\text{s warp counts.}$$

LOOM REQUIRED.

Diaper cloth may be woven on single box dobby or cam looms. If woven on the latter, a cam arrangement of 8 picks to the round, with selvedge motion extra, would be required. As it is not necessary to stop production for ordinary misweaves, the cam loom would be the best to use on account of its steadier running.

FINISHING.

The object of the finishing process is to rid the fabric of the cotton wax and foreign matter, and render it absorbent, white and clean. This is accomplished by treating with an alkaline solution of caustic soda, bleaching, washing and drying. It is then sterilized by formaldehyde or steam, dried, and made up, usually in 10-yard bolts covered with a sealed wrapper.

BALINE.

Baline comprehends a class of goods that is, in point of texture, between the coarser stuff known as burlap and the lighter and somewhat finer material known as canvas.

Baline is practically a coarse kind of canvas. It is made from the best grades of jute, flax and hemp and is used for numerous purposes. The very coarse quality is used principally for wrapping merchandise, and the finer grades are used for curtains and upholstery purposes, and also for stiffening wearing apparel, etc.

Baline, as used for stiffening wearing apparel, is inserted between the surface cloth and the lining, usually at the lapels and sleeves, in order both to stiffen and retain the shape or setting of that portion of the garment.

THE GOODS

are made in various widths; that used for upholstery purposes ranges from 50 inches to 64 inches, and that used for tailoring purposes usually comes in narrow widths from 22 inches to 36 inches. The narrow goods, however, are usually woven double width with fast centre selvedges, then cut in two parts during the finishing.

Baline is made in several qualities. The best grades are made up entirely of tow yarn, a short flax fibre, another grade is made with a combination of tow yarn and hemp or jute, and the lower qualities are usually made entirely from either hemp or jute.

In the combination fabric the hemp or jute usually figures as filling, while the flax or tow yarn is used for the warp, because the latter is with less difficulty made up into a smoother and stronger thread than either hemp or jute. The

WARP AND FILLING

for these goods interlaces on the plain

weave system. The goods used for decorating purposes are dyed in the piece and the prevailing colors are dark red, garnet, and various shades of blue. The goods used for wrapping merchandise and tailoring purposes are finished in their natural color, which is a kind of drab, or light brown, depending on the material used in the construction of the goods.

The baline used for tailoring purposes is the finest in point of texture, and the goods used for decorative purposes closely resemble the common burlap, as far as texture is concerned. In the finishing, the coarser grade of baline receives considerable attention, being dyed and sheared, and presents a much more attractive appearance than the common burlap, which is only pressed after it comes from the loom.

Analysis of goods used for stiffening:

Width in reed, double width, 50 inches; finished at 47½ inches.

Reed, 16x2, 34 picks per inch; warp, 12 cut tow yarn; filling, 12 cut jute; ends in warp, 1,600; extra ends for all. 8; total, 1,608; weight per yard, 15 ounces.

Take-up in warp during weaving about 15 per cent.

FINISHING.

The finishing of these goods depends entirely upon the use for which the fabric is intended. The quality used for upholstery purposes and curtains is dyed after the goods are woven, then sheared on both sides and usually softened, especially so if intended for curtains. The goods used for tailoring purposes are finished in their natural color and stiffened. Some are stiffened much more than others, depending on the use for which they are made. The materials used for stiffening are glue and flour. If a very stiff finish is desired, equal proportions of glue and flour are used. The goods used for wrapping are merely sprinkled, then pressed, after which they are made up into rolls or laps.

Dyeing Particulars.

NAVY BLUE.

Three and one-half per cent formyl blue B; 30 per cent Glauber's; 2 per cent alum.

BLACK.

Five per cent jute black G; 30 per cent Glauber's; 3 per cent alum.

RED.

Five per cent fast red R; 30 per cent Glauber's; 3 per cent alum.

SKY BLUE.

One per cent patent blue B; 25 per cent Glauber's; 3 per cent alum.

Most of the acid colors can be dyed on this fabric with Glauber's and alum at the temperature of about 190 degrees, in a jig dye machine The goods are boiled out with Glauber's salt and sal soda to soften the fibre a little before the dyeing operation.

The addition of a little acetic acid the last fifteen minutes is beneficial to most colors.

HONEYCOMB CLOTH.

Honeycomb cloth derives its name from its very close resemblance to an ordinary wax honeycomb.

In combination with other weaves the honeycomb type of weave is extensively used in the manufacture of honeycomb and so-called crochet quilts. It is also used for cotton warp and wool filling shawls and baby carriage robes, in which the warp is considerably finer than the filling in order that it will show as little as possible.

The honeycomb type of weave was formerly used to some extent in the construction of cotton toweling. The cell-like fabric, which is practically identical in appearance on both sides, would appear to be excellently adapted for toweling, the plain weave portions giving the necessary strength and the long floats of yarn readily absorbing moisture, but for some reason or other it is not seen in the market to any extent at the present time.

Low and medium counts of yarn are usually used for honeycomb cloths.

Figs. 1 and 2 illustrate two honeycomb weaves, on 8 ends by 6 picks and 8 ends by 8 picks, respectively. A study of these will show that some ends and picks interlace more than others in a repeat of the weave and that they are constructed on diamond bases.

Unlike the majority of single weave cloths, the effect in honeycomb cloth differs entirely from that seen on the design paper, the diamond effect on the paper being substituted by the cellular effect in the cloth. This feature is due to the fact that yarns appear more or less prominent, when woven into the cloth, according to the smaller or greater amount of interlacings respectively.

WEAVES.

In the type of cloth under consideration the longer floats of warp and filling form the ridges of the honeycomb cells, while the yarns which interlace to a greater degree form the recesses of the same. The long warp floats on one side are opposite the filling floats on the other.

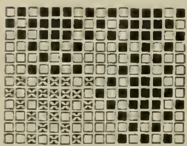


Fig. 1.

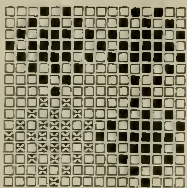


Fig. 2.

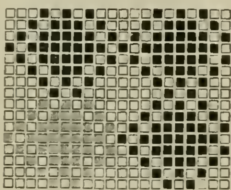


Fig. 3.

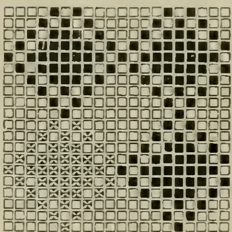


Fig. 4.

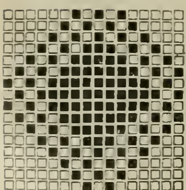


Fig. 5.

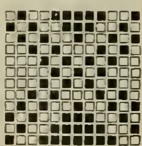


Fig 6.

Honeycomb weaves vary in size within certain limits. The larger the weave, the less firm the structure of the cloth. Figs. 3 and 4 illustrate weaves on 10 x 8 and 10 x 10, respectively. With the same amount of material, cloths constructed with these would not be as firm as they would if weaves Figs. 1 and 2 were substituted. When large effects are desired, the weave is modified and strengthened by the addition of a plain weave around the diamond, or, as it is termed, a double diamond is used for a base.

Fig. 5 illustrates a weave of this type.

Fig. 6 illustrates another variation of the honeycomb weave on 12 x 12. The type of design illustrated in Figs. 2 and 4 is the one generally used. The crosses in Figs. 1 to 4 indicate one repeat of the weave.

These fabrics are made on ordinary dobby looms. One beam only is used.

BRIGHTON CLOTH.

Brighton cloth is distinguished by a general effect on the face somewhat similar to honeycomb cloth, but unlike the latter, it is not reversible, the appearance on the back differing from that on the face. The principal difference between honeycomb and Brighton weave effects is that the cells of the former appear of uniform size, on the square or rectangular base, whereas those of the latter appear in

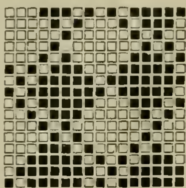


Fig. 1.

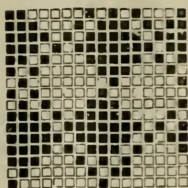


Fig. 2.

two sizes, large and small, alternately, both warp way and filling way, on the drop or plain weave order base.

Brighton cloth is not essentially a cotton cloth, the Brighton weave, which distinguishes the fabric, being used in fabrics made with other materials. The Brighton type of weave is used in making cloths intended for dress goods, also in combination with other weaves to form parts of large jacquard pat-

terns, in substitution for the honeycomb weaves.

In designing the jacquard patterns care must be exercised to have the Brighton weave correct, the long floats of warp and filling being in certain positions in relation to each other, or the effect will be spoiled. For illustration, Figs. 1 and 2 are two weaves which at first glance appear to be similar. Fig. 1 is a correct Brighton weave and differs from Fig. 2 in having the long

Fig. 3.

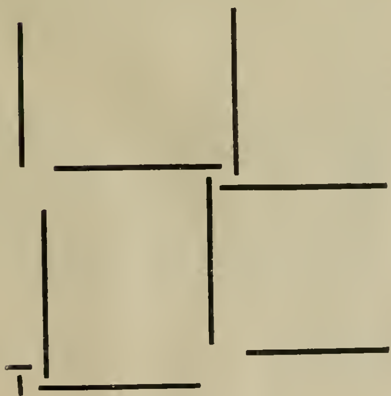


Fig. 4.

floats of yarn form a square, whereas in the latter they form a cross. Figs. 3 and 4 represent the long floats in Figs. 1 and 2, respectively, vertical lines indicating warp floats and horizontal lines filling floats.

Figures 5 to 7 illustrate the several stages in the construction of a 12 x 12 Brighton weave. Fig. 5 shows the 12 x 12 diamond base. Crosses in Fig. 6 indicate a second line of twill in one direction, added to the base, Fig. 5. Marks ◻ in Fig. 7 indicate where warp spots have been added in the left and right hand corners of the large spaces, the same now being divided into two warp flush and two filling flush diamonds of equal size.

The ridges of the cells in the cloth are formed by the long floats of warp at the sides and the long floats of filling at the top and bottom of each diamond. The two sizes of cells are formed by the intervals between the ridges being greater and less (as will be seen by Fig. 3, which simply indicates the ends and picks covered by the long floats in one repeat of

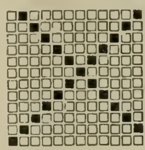


Fig. 5.

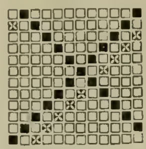


Fig. 6.

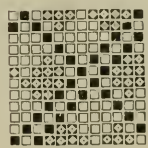


Fig. 7.

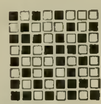


Fig. 8.

weave Fig. 1), thereby enclosing larger and smaller areas, alternately.

Brighton weaves are made on the same number of ends as picks, this number being a multiple of 4, on from 8 x 8 upwards. Figs. 1, 7 and 8 are the weaves generally used, the same being on 16 x 16, 12 x 12 and 8 x 8 respectively.

LOOM REQUIRED.

Brighton cloth is woven on a single box dobby loom from one warp and one filling. It is usually woven white and piece dyed afterwards.

GALATEA.

Galatea cloth has been somewhat in demand the past two or three years by women requiring serviceable and neat-appearing cotton fabrics at a medium price. One selling house advertises it as being particularly suitable for children's dresses that have to be subjected to excessive wear, washing and ironing; also for women's outing suits, and shirtwaists.

The demand appears to be increasing, probably partly due to the fact that

one or more firms are specializing on the fabric and are advertising it.

GALATEA

is usually finished 27 inches wide and retails at 14 to 20 cents per yard. It is shown in plain colors as well as in figured, dotted and striped designs on white and colored grounds. The patterns are obtained by printing. Some manufacturers have evidently found that they can take a standard type of fabric and extend its use by varying the process of finishing it. The base of the cloth, i. e., the fabric previous to bleaching, dyeing or printing, is nothing more than an ordinary 5-end warp sateen of fair quality.

A galatea in a

SIMPLE STRIPE PATTERN

is considered here, the analysis of which shows the following construction data: Width of cloth, 27 inches; ends per inch, 124; picks per inch, 56; warp counts, 23s, right twist; filling counts, 24s, right twist; weight, 3¾ yards per pound; weave, 5-end warp satin. (Fig. 1.)


Fig. 1.


Fig. 2.

Each selvedge consists of 24 ends working as 12 and weaves 2 picks in a shed. The cloth has been reeded 5 ends per dent in the body of the cloth and 6 ends per dent in the selvedges.

CALCULATIONS.

27 inches x 124 sley equals 3,348 ends, plus 8 extras for selvedges (there being 1 end per dent more than in the ground) equals 3,356, total ends.

$$\frac{3{,}356 \text{ (ends)} \times 105 \text{ (length)}}{23 \text{ (counts)} \times 840} = 18.24 \text{ lbs. warp in 100 yards of cloth.}$$

$$\frac{30 \text{ (width in reed)} \times 56 \text{ (pks.)} \times 100 \text{ (length)}}{24 \text{ (counts)} \times 840} = 8.33 \text{ lbs. filling.}$$

18.24 lbs. warp.
8.33 lbs. filling.

26.57 lbs., weight of 100 yard cc
100 divided by 26.57 = 3.76 yards per pound.

When weighing a small sample of the cloth under consideration 5⅝ square inches was found to weigh 10.7 grains.

$$\frac{5\tfrac{5}{8} \text{ (sq. inches)} \times 7{,}000 \text{ (grs.)}}{10.7 \text{ (weight)} \times 27 \text{ in. (cloth width)} \times 36 \text{ (inches per yard)}} = 3.78 \text{ yards per pound.}$$

LOOM REQUIRED.

Galatea can be produced most economically on single box cam looms in which an auxiliary motion is used for actuating the selvedge yarns.

On account of the large number of ends per inch, and the fact that four out of every five ends are required to be on the face every pick, the cloth is woven face down in the loom and the harnesses actuated as shown in Fig. 2. The drawing-in draft is straight, with the ends drawn one through each heddle.

FINISHING.

The finishing of galatea is of simple character. It consists in bleaching, it for white, and printing, if for colored, patterns. A light starch, just enough to make the fabric handle firm, is used.

Carding and Spinning Particulars.

Galatea is made up of yarns the average count of which is about 25s. For this article we will consider the warp to be 23s and the filling yarn 24s, both right twist. The cotton used for this fabric would be peeler cotton of a medium grade and 1⅛-inch staple. If large quantities of this cloth are required, the mixing should be done by machines. Any of the methods previously described may be used,the object being to have a dry, fluffy cotton fed to the openers. If only a small mixing is going to be used, the mixing may be done by hand, but when mixed in this manner

THE MIXING

should be allowed to stand longer before using, so that it will become thoroughly dry and not have to be fed green. When cotton is fed green to the pickers there is more likelihood of a fire at these machines. The cotton is next put through three processes of pickers and an opener. At the breaker picker there are generally two sets of cages and two beaters. The first beater that the cotton comes in contact with has three blades and its speed is 1,100 revolutions per minute. The front beater of this machine has two blades and its speed is 1,425 revolutions per minute. The total

WEIGHT OF THE LAP

at this machine is about 40 pounds, although in a great many mills the laps

at the front of the breaker and intermediate pickers are allowed to become as large as can be handled before doffing them. The weight per yard is 16 ounces. The laps from the breaker are put up and doubled four into one at the intermediate. The beater on this machine is generally of a 2-bladed type and the speed of it 1,400 revolutions per minute. The total weight of a 40-yard lap is 37½ pounds, or a 15-ounce lap. At the finisher picker the beater may be either the pin or the 2-bladed rigid type. If the former, the speed should be about 1,350 revolutions per minute, and for the rigid type 1,450. It will be at once seen that a greater number of blows will be struck with the pin beater, but it is claimed that the pins of this beater enter the cotton and do not strike it as forcibly as the blade of a rigid type beater. On the other hand, many carders object to the pin beater, especially on the longer-staple cotton, claiming that it

PUTS IN NEPS.

For this fabric the total weight of a 40-yard lap should be 36¼ pounds. A variation of one-half either side of standard should be allowed and every lap weighed. Look out for split laps and see that every part of the picker is working freely, that the evener motions are in perfect order, for remember, it is on this arrangement that the evenness of the lap depends. At the card the draft should not be over 105. The speed of the licker-in is 375 revolutions per minute. Flats (110) make one complete revolution every 45 minutes. Use medium count wire fillet. Strip, grind, clean, etc., as given in previous articles. The production for this fabric should be 775 pounds per week of 60 hours and the weight per yard of sliver should be 60. This is then put through three processes of drawing frames. For this class of goods

METALLIC ROLLS

may be used to good advantage. For this length of staple with metallic top rolls spread the bottom steel rolls as follows: Front to second 1 5-16 inches; second to third, 1 7-16 inches; third to back, 1 9-16 inches. If leather top rolls are used instead, close rolls a good sixteenth. The speed of the front roll may be anything up to 400 revolutions per minute, according to the amount of drawing needed. As has been said many times before, as this is really the last machine at which evening takes place (to any great extent), watch to see that the stop-motions are working properly. Also watch the clearers and see that the sliver is being coiled properly in the can, because nothing causes more waste and trouble than poorly coiled sliver in cans. Size four times a day and allow a variation of two grains per yard (average) before changing. Scour drawings frequently. The weight per yard of sliver at the finisher drawing is 75 grains per yard. The doublings are 6 into 1. At the slubber the drawing is made into .45 hank roving, after which it is put through two processes of

FLY FRAMES

and made into the following hank roving at each: first intermediate, 1.65; fine, 5 hank. This is taken to the spinning frame and for the warp is spun into 23s, with a right-handed twist. Otherwise than being twisted right-handed, the particulars are as follows: 2-inch diameter ring, 7-inch traverse, 9,500 revolutions per minute spindle speed and a twist per inch of 22.7 + . The yarn is then spooled, warped and put through the slasher.

The filling yarn for this fabric is also a right twist, otherwise the particulars for the frame are as follows: 1½-inch diameter ring, 6½-inch traverse, spindle speed 7,600 revolutions per minute. The yarn is then conditioned.

Dyeing Particulars.

Following are dyeing particulars for 100 pounds of goods.

PINK.

Four ounces Erica pink G; 10 pounds Glauber's; 1 pound sal soda.

LIGHT BLUE.

Six ounces diamine sky blue F F; 10 pounds Glauber's; 1 pound sal soda.

CREAM.

Four ounces immedial yellow D; 2 ounces immedial cutch G; 1 pound sulphide sodium; 2 pounds soda ash; 10 pounds salt.

NAVY.

Ten pounds immedial indone B; 10 pounds sulphide sodium; 3 pounds soda ash; 30 pounds salt.

WINE.

Six pounds brilliant Bordeaux R; 2 pounds sal soda; 30 pounds Glauber's.

TAN.

One pound immedial cutch B; 1 pound immedial yellow D; 3 pounds sulphide sodium; 30 pounds salt; 3 pounds soda ash.

VELOUR.

Velour is a type of filing pile fabric, of fair to good quality, made on the weave principles explained in the article dealing with velveteens. It differs from velveteen in having pile filling of some material other than cotton.

Velour for dress and cloaking purposes is made with 2 or 3 ply cotton yarns for the warp and filling of the ground cloth, and mohair or lustre worsted filling for the pile. The cloth widths range from about 27 inches to 54 inches. The weights and qualities also vary, as will be inferred from a recent retail price list for 32-inch goods. These prices range from $2 to $4 per yard.

The better qualities of dress velours are usually from 27 inches to 32 inches wide.

Large quantities of velour fabrics are also used for curtain and upholstery purposes, the points of the fibres receiving and reflecting the light and indicating full, deep colors. The peculiar manner in which the cloth is constructed makes it an excellent wearing fabric. In jute velours, which are used for upholstery purposes to a greater extent than animal fibre pile velours, the pile yarn is of jute.

In dress fabrics, velours are usually of solid color. For upholstery purposes they are of solid or various colors and patterns, the result of printing, embossing, cutting or burning.

The word velour, or velure, is also given to a pad of pile fabric used by hatters for smoothing and giving a lustre to the surface of hats.

THE ANALYSIS

of a characteristic velour fabric, 50 inches wide, retailing for $2.25 per yard, indicates the following construction data: Ends per inch, 68; picks, per inch, 225, including 45 ground picks and 180 pile picks; warp counts, 2-ply 20s cotton; ground filling counts, 3-ply 45s cotton; pile filling counts, 25s worsted: weight, 21.13 ounces per yard; weave, Fig. 1. The picks are arranged 2 ground to 8 pile.

When analyzing pile fabrics care must be taken not to omit to consider the structure of the cloth. If analyzed as an ordinary fabric the weave for the fabric under consideration would appear as shown in Fig. 2, and there would appear to be an equal number of

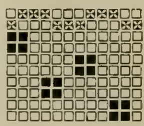


Fig. 1.

Fig. 2.

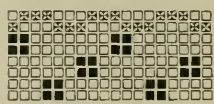


Fig. 3.

ground as pile picks. Fig. 3 shows a weave that could be used if the pile was required to be shorter and less dense than with Fig. 1. Crosses in Figs. 1 to 3 indicate ground picks; ■ indicate pile picks.

Another point to consider is the method of ascertaining the counts of the

PILE FILLING.

Obviously a definite length cannot be measured with any degree of accuracy after it has been cut into very small pieces. Knowing the construction and weight of the fabric, and the counts of the ground yarns, the pile yarn counts may be found as follows:

68 (ends) x 50 (width) = 3,400 ends.

$$\frac{3{,}400 \times 105 \text{ (length)}}{10 \text{ (counts)} \times 840} = 42.5 \text{ lbs. warp.}$$

$$\frac{45 \text{ (picks)} \times 55 \text{ in. (width in reed)} \times 100 \text{ (length)}}{15 \times 840} = 19.64 \text{ lbs. of ground filling.}$$

$$\frac{21.13 \text{ ozs. (weight per yard)} \times 100 \text{ (length)}}{16 \text{ (ozs. per pound)}} = 132.06 \text{ lbs. weight of 100 yard cut.}$$

42.5 lbs. warp.
19.64 lbs. ground filling.

62.14 lbs. ground yarn.

132.06 — 62.14 = 69.92 lbs. pile filling.

$$\frac{180 \text{ (picks)} \times 55 \text{ in. (width in reed)} \times 100 \text{ (length)}}{69.92 \text{ (lbs.)} \times 560} = 25 + \text{ counts of pile filling.}$$

LOOM REQUIRED.

Velours require a two-box dobby loom of heavy pattern, with a special take-up motion on account of the large number of picks per inch. One beam only is required.

FINISHING.

The finishing process consists of cutting, singeing or gassing, scouring, bleaching (if for white), dyeing and drying. Upholstery goods are printed after being dried, usually by the discharge process. Embossed effects are almost entirely confined to solid color fabrics and are obtained by pressure under suitable heated and prepared rollers.

For other data regarding filling pile fabrics the reader is referred to the articles on "Velveteen" and "Velveteen Cutting."

Carding and Spinning Particulars.

Velour is made out of two different lengths of staple of American peeler cotton and a worsted yarn. The counts of yarn used in the sample under description are as follows: Warp counts, 2-ply 20s, which is made from 1 1-16-inch stock, and for ground filling counts 3-45s, which is made out of 1 5-16-inch stock, and for pile filling, 25s worsted yarns, which is equal to a 16 2-3s (single) cotton yarn. The cottons for both lengths of staple are stapled in the usual manner and in large mills are mixed by machines, while in small mills, or mills using a small quantity of these lengths of staples, the mixing is done by hand. For both stocks the

PICKING PARTICULARS

are practically the same and one method will answer for both. They are put through three processes of pickers and an opener, the breaker picker, being known as a combination picker, having two sets of cages and two beaters; the first, or that beater coming into contact with the cotton first, has three blades and revolves at a speed of 1,125 revolutions per minute, while the front beater is generally two-bladed, having a speed of 1,500 revolutions per minute. The total weight of a lap is 40 pounds or a 16-ounce lap These laps are put up at the intermediate picker and doubled four into one. At this picker the beater is of a rigid, two-bladed type and its speed is 1,425 revolutions per minute The total weight of a 42-yard lap is 38½ pounds, or a 14½-ounce lap. At the finisher picker, the speed of a three-bladed pin beater is 1,400 revolutions per minute, and of a two-bladed rigid beater 1,450 revolutions per minute. The total weight of a 50-yard lap is 46 pounds net for the 1 1-16-inch stock or a 14½-ounce lap and 39 pounds net or a 12½-ounce lap for the 1 5-16-inch stock.

AT THE CARD

there are several minor changes from one stock to the other, the principal ones being as follows: The distance from feed plate to licker-in should be increased so as not to injure or break the longer staple. For the shorter stock the draft should be not more than 100. Set feed plate to licker-in to 7-1,000th gauge; flats to cylinder, 7-1,000ths; doffer to cylinder, 7-1,000ths; doffer comb to doffer, with a 10-1,000ths gauge, the other settings being the same as those used for indigo prints. For the longer stock set feed plate to licker-in 17-1,000ths; flats to cylinder, 7-1,000ths; doffer to cylinder, 5-1,000ths, etc. The draft for this length of staple should not be less than 100 and 110 of a draft is better. The percentage of all waste at the card for 1 1-16-inch stock should not exceed 7¼ per cent and for 1 5-16-inch staple 8½ per cent. Strip, grind and clean as shown formerly when the same lengths of staple were being described. The weight per yard for 1 1-16-inch staple should be 60 grains per yard and for the 1 5-16-inch stock, 55 grains per yard. The

PRODUCTION

for a week of 60 hours should be as follows: 1 1-16-inch staple, 750 pounds and 1 5-16-inch staple, 550 pounds. The 1 5-16-inch stock is combed (although for all grades of velour the yarn is not combed). The general method followed is as follows: Sliver lap 16 into 1 or an 8¾-inch lap; weight of finished lap per yard, 420 grains. The sliver laps are doubled 6 into 1 or to a 10½-inch lap, the weight being 440 grains per yard. These laps, in turn, are put up at the comber and doubled eight into one, the weight of the finished sliver being 65 grains per yard. Set the comber as before described for this length of staple. For this class of goods 16 per cent of waste is taken out. Use one of the receipts for varnish that have been given from time to time, and keep all leather rolls in good condition, no matter whether they are on sliver lap, ribbon lap, combers, drawing frames or slubbers and speeders. The sliver from the comber is put through

TWO PROCESSES OF DRAWING.

the doubling 6 into 1 at each process. The speed of the front roll depends upon conditions, but a fair speed is 350 revolutions per minute. The weight

per yard of finished sliver is 75 grains. The 1 1-16-inch stock is put through three processes of drawing, the weight of the sliver being 75 grains per yard. Size at the ribbon lap twice a day, an allowance of five grains per yard being allowed from standard before changing. At the drawing frame size four times a day, a variation of two grains per yard being allowed. The drawing frame should be set for 1 5-16 inch stock, front to second, 1 7-16 inch; second to third, 1 9-16 inch and third to back, 1¾-inch for leather top rolls; for metallic rolls, spread rollers ⅛ to ¼ of an inch farther apart.

AT THE SLUBBER

the drawing is made in .60 for both stocks, after which the slubber roving is put through two processes of speeders for 20s yarn, the hank roving at each process being 1.50 at first, and 4 at second. This is spun into 20s on a frame with a two-inch diameter ring; 7-inch traverse; 21.24 twist per inch, and spindle speed of 9,400 revolutions per minute, after which the yarn is spooled and twisted into 2-20s and then warped and put through a slasher. The slubber roving for 45s is put through two processes, the hank roving at each being 2.50 at first and 10 hank at the fine. This roving is spun into 45s on a frame with 1¼-inch diameter ring; 5½-inch traverse; 25 + twist per inch and a spindle speed of 8,500 revolutions per minute. The yarn is then twisted into 3-45s yarn and conditioned.

Dyeing Particulars.

WINE.

6 per cent brilliant diamine Bordeaux R; 3 per cent sal soda; 30 per cent Glauber's; topped with 1 per cent saffranine.

NAVY BLUE.

8 per cent immedial indogene B; 8 per cent sulphide sodium; 3 per cent soda ash; 30 per cent salt; topped with 1 per cent brilliant green G; 1 per cent methyl violet B.

OLIVE.

6 per cent katigen olive G N; 2 per cent katigen green 2 B; 1 per cent katigen brown B; topped with 1 per cent auramine; 1 per cent brilliant green crys.

BROWN.

6 per cent immedial cutch G; 2 per cent immedial yellow D; 1 per cent immedial brown B; 10 per cent sulphide of soda; 3 per cent soda ash; 30 per cent salt; topped with 2 per cent auramine; 2 per cent Bismarck brown.

SLATE.

3 per cent immedial black N N; 4 per cent sodium sulphide; 3 per cent soda ash; 30 per cent salt; topped with 4 ounces methyl violet B; 1 ounce brilliant green B.

GRAY.

1 per cent immedial black N N; 2 ounces immedial yellow D; topped with 2 ounces brilliant green B; 2 ounces methyl violet B.

FAWN BROWN.

4 per cent immedial brown B; 2 per cent immedial brown R R; 6 per cent sulphide soda; 3 per cent soda ash; 30 per cent salt; topped with 2 per cent Bismarck brown R.

BOTTLE GREEN.

6 per cent immedial green B B; 2 per cent immedial dark green B; 8 per cent sulphide sodium; 3 per cent soda ash; 30 per cent salt; topped with 1 per cent brilliant green B.

PEACOCK GREEN.

4 per cent immedial new blue G; 4 per cent sulphide sodium; 3 per cent soda ash; 25 per cent salt; topped with 2 per cent brilliant green B.

All these shades are dyed with the sulphur colors, well rinsed with water and dyed again at 180 degrees F., and well rinsed in water again and dried.

BLACK.

10 per cent immedial brilliant black G; 10 per cent sodium sulphide; 3 per cent soda ash; 30 per cent salt; topped with 4 per cent immedial indone B; 4 per cent sodium sulphide; 3 per cent soda ash; 20 per cent salt. Rinsed and soaped.

GLORIA SILK or GLORIA CLOTH.

Gloria silk or gloria cloth is a name applied to a fabric used extensively for umbrellas. This fabric is made up of fine organzine silk warp, and either cotton, worsted or mohair filling.

The finest grades of this fabric are made with a fine organzine silk warp and fine French spun Australian worsted filling of a very high texture,

both warp and filling, while in the cheaper grades cotton is substituted for worsted.

The fabric made with silk and worsted is oftentimes used as a dress fabric, with a slight change in texture; the counts of the materials may be a little finer and the ends and picks per inch are less than in the umbrella fabrics.

The fabric used as dress goods is commonly known to the trade as lansdown. This fabric, by reason of the texture, is softer to the touch than the gloria cloth.

Both fabrics are made in the gray, then dyed in the piece. The fabric used for umbrellas is usually dyed black and the fabric intended for a dress is dyed in various shades of solid colors, such as lavender, pink, blue, sometimes finished in pure white or bleached and sometimes the goods are dyed black, if the trade desires it.

A distinguishing feature of these fabrics in conjunction with the materials used is the weave, which is a three-end twill, $\frac{2}{1}$, and is woven in a width of about 45 inches in reed.

In the best grades of the umbrella

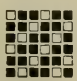


Fig. 1.

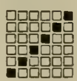


Fig. 2.

fabric the construction is of such a high texture that the fabric need not be waterproofed as are some fabrics used as a protection against the elements, as, for instance, raincloth, which is rainproofed during the finishing process. The texture of the gloria cloth is sufficiently compact to be impervious to the rain.

ANALYSIS

follows of fabrics used for umbrellas and also fabrics used for dress goods.

First, Gloria cloth: width of warp, in reed, 45 inches; width of fabric finished, 40-41 inches; ends per inch in reed, 55x3, equals 165; ends per inch finished fabric, 180; warp, 1¼ dram organzine silk.

Take-up during weaving, 8 per cent.

Practically no shrinkage in cloth in length during finishing.

Filling, 160 picks per inch; 1-70s French spun Australian worsted.

Second: Lansdowne: width in reed, 45 inches; width of fabric finished, 40-41; ends per inch in reed, 150—50x3 reed; ends per inch in finished fabric, 168; warp, 1¼ dram organzine silk.

Filling, 150 picks; 1-90s French spun Australian worsted.

These fabrics are woven on harness looms; the warp is drawn straight on six harnesses, through French string heddles. This particular heddle is almost indispensable in silk weaving.

Fig. 1, two repeats of weave.

Fig. 2, drawing-in draft.

Carding and Spinning Particulars.

Gloria cloth is made up from many different raw stocks and may be either composed of worsted, silk, mohair or cotton yarns or a combination of any two. Gloria is sometimes called umbrella cloth on account of its extensive use for covering this article, and when used for this purpose it is generally constructed from cotton yarns. The counts of the yarn used vary from 40s to 60s, but a good average would be 45s for both warp and filling. The raw stock used for the better cloth is Egyptian cotton of 1⅜-inch staple, but it is the general rule nowadays to mix Allen 1⅜-inch staple cotton with the Egyptian, so as to cheapen the cloth, the proportion of American cotton used varying from one-sixth to one-half, the blending being generally done at the breaker drawing frame. The cottons should be mixed and up to the drawing frame run separately. They should be mixed in the usual manner; if a bale breaker is used better results will be obtained and the mixings will not have to stand as long to dry out as when hand mixings are made. The cotton is put through an opener and three processes of pickers. On the opener the stripping roll should be set about one-half an inch from the lifting roll and

THE HOPPER

should always be kept three-quarters full of cotton. The processes of pickers used may be three, as stated before, or two, the breaker being what is known as a combination picker, that is, having two beaters and two sets of cages. For various reasons the latter method is considered the better of the two. In this article we will consider the processes to be three separate pickers, although the speeds of the beaters given may be used if two processes of pickers are used. The speed of the breaker beater is 1.350 for a two-bladed beater and 900 revolutions per minute for a three-bladed beater. The total

weight of a lap at the front would be about 40 pounds, or a 16-ounce lap. These are doubled 5 into 1 at the intermediate picker. The speed of the beater of this picker is 1,300 revolutions per minute. The total weight of a lap at this machine is 37½ pounds, or a 15½-ounce lap. These laps are put up at the finisher picker and doubled 4 into 1. The speed of this beater is 1,200 revolutions per minute, and the weight of a lap is 31½ pounds, or a 12½-ounce lap.

THE SPEEDS

of the beater given above are for the Egyptian stock. The Allen seed would require a higher speed of the beater to get the dirt out, the increase being about 100 revolutions per minute at each process. Every lap should be weighed as it is taken from the finisher picker, a variation of one-half a pound from the standard weight being allowed. The laps are then put up at the card and given a draft of 110. The speed of the flats is one complete revolution every 40 minutes; set and grind as usual. The production should be about 500 pounds a week of 60 hours, the weight of the sliver being 50 grains per yard. Strip cards three times a day for a 10½-hour day. The card sliver is next put through a sliver lap machine, the doublings for an 8¾-inch lap being 16 into 1. The weight of a yard of this lap at the front is 280 grains. These are put up at the ribbon lap machine and doubled 6 into 1. The weight of a yard of lap at the front of this machine is 275 grains per yard. The spread of the rolls at the ribbon lap for this staple is, front to second, 1⅝ inches; second to third, 1¾-inches; third to back, 1⅞ inches. These laps are put up at the comber and doubled either 6 or 8 into 1, according to the number of heads the comber contains. For this article we will assume 6. The speed is 90 nips per minute, the weight of sliver delivered being 40 grains per yard. The percentage of waste taken out is 16. If larger laps than 8¾ inches are used the weight of the lap, etc., will be proportionately heavier. Set and time as given in a previous article. At the drawing frame the doubling at each of the two processes used is 6 into 1. It is at this machine that the blending is done, three ends of American cotton being run in with three ends of Egyptian.

THE WEIGHT

of the drawing at the front should be 50 grains per yard. The rolls should be set as follows: front to second, 1½ inches; second to third, 1⅝ inches, and third to back, 1¾ inches. Size four times a day and allow a variation of two grains per yard either side of standard before changing. Varnish and change leather top rolls frequently. At the slubber the silver is made into .70 hank roving and is then put through three processes of fly frames, the hank roving at each process being as follows: First intermediate, 1.40 hank; second intermediate, 3.40 hank, and fine frame, 9.40 hank. The twist per inch put into the roving is very important and for making these yarns the following twists are used at the slubber: 73 turns per inch; first intermediate, 1.01 per inch; second intermediate, 1.85 per inch, and fine, 3.7 per inch. Lay close and size fine frames once a day, and slubbers once a week.

BETTER RESULTS

are obtained if either self-weighted rolls are used on the fine frames or if not using self-weighted rolls take weight off of second roll and take one tooth of draft out between second and third rolls. Watch the leather rolls to see that they are in perfect condition. The yarn is taken to the mule room and spun with a soft twist for both warp and filling; the warp yarn is then run on to spools, after which it is warped and slashed and is then ready for the beam. Particular care has to be taken with this fabric to keep it free from neps on account of their showing up so plainly when made up on the umbrella, and it is a good plan to watch the beaters, flats and settings at the card, percentage and settings at the comber.

Dyeing Particulars.

Gloria cloth is made for the umbrella trade. When composed of silk and wool it is dyed by special colors, made by such firms as the Cassella Color Co., Continental Co. and others, the colors dyeing wool and silk in one bath. For cheap imitation gloria cloths of cotton and wool, a union black is dyed: 5 per cent union black B, 20 per cent Glauber's salt. Boil forty minutes, and run without steam for forty minutes longer.

For

ALL COTTON CHEAP GLORIAS,

which are not glorias at all, as the only real gloria cloth is made from silk and wool, the aniline salt black is dyed; the goods are passed through a solution of aniline salt, dyed and aged and developed and washed.

CANVAS.

Canvas is a term applied to heavy, plain weave cloths made with coarse, ply cotton yarns. It does not refer to any particular grade or weight of cloth.

Canvas cloth is used for mail bags, coverings for boats, in the manufacture of tents, etc. The

ANALYSIS

of a heavy characteristic canvas fabric indicates the following construction data: ends per inch, 31; picks per inch, 24; warp counts, 6-14s; filling counts, 9-14s; cloth width, 24 inches; reed width, 25¼ inches; weight, .72 (72-100) yard per pound; plain weave. A characteristic feature of heavy, plain cotton fabrics is seen in this cloth in that the warp has contracted in length about 25 per cent. Goods of this character would be woven on heavy cam looms of the type used for weaving duck.

Fig. 1 is a weave of the mock leno type, sometimes termed a canvas weave. Cloth made with this weave

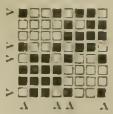


Fig. 1.

is characterized by small perforations, caused by some of the ends and picks, indicated by the arrows, cutting or opposing each other, while other ends and picks in the same weave come closely together. This cloth is used as a base or ground for embroidery work, and the perforations noted have a distinctive value as an aid in indicating readily where to insert the needle.

Carding and Spinning Particulars.

Canvas is made up in a great many grades, but usually the counts of the yarns do not vary as much for the different grades as for different grades of finer fabrics. The sample of canvas taken for description is made up of 6-14s warp and 9-14s filling. This count of yarn (considering the fabric) would be made up of from 15-16 to 1 1-16 inch staple, of a medium grade, and for this grade of fabric the cotton would not be combed. If large mixings are required, i. e., over 60 bales a day, a bale breaker should be used or some arrangement made whereby the mixing can be done by machines; if a smaller amount of cotton is required, then a hand mixing will answer. It will be found a great advantage to use machinery for mixing; any of the up-to-date machines and systems are all right. The cotton is next put through an opener and three processes of pickers. The pin roll, or, as it is sometimes called, the evener roll, should be set about one-half an inch from the lifting apron. The breaker picker is what is known as a combination picker, having two sets of beaters and two sets of cages.

THE BEATER

that first receives the cotton is generally of a three-bladed type and its speed is 1,400 revolutions per minute. The front beater of this same machine has two blades, and its speed is 1,450 revolutions per minute. The total weight of a lap at the front end of this machine is 40 to 50 pounds, according to length of lap run. Some overseers do not have a full lap knock-off on either the breaker or the intermediate picker, but the attendant doffs this lap at will. These breaker laps are doubled four into one at the intermediate picker. This picker is equipped with an evener motion and has a two-bladed beater, the speed of which is 1,400 revolutions per minute. The weight of a full lap is about 40 pounds, but generally this picker has no full lap knock-off, so the laps would weigh more or less for a full lap, but just the same per yard. Four of these laps should be doubled into one at the finisher picker. This is equipped with a pin beater, the speed of which is 1,400 revolutions per minute. The total weight of a 46-yard lap is 48½ pounds gross, or 46 pounds net, or a 12-ounce lap. Every lap should be weighed on this kind of stock, for it is generally a very sensitive cotton to weather conditions. Watch the evener motions to see that they are working properly and are clean. Run good sliver waste up in the usual manner. At the cards the draft should not exceed 100 and the flats should make one complete revolution every 40 minutes; set and grind as instructions in article on indigo prints. Strip out every three hours or three times (both cylinder and doffer) a day for a 10½-hour day. If humidifiers are run,

THE HUMIDITY

should be about 55 degrees. The production of a card for a week of 60 hours should be 650 to 750 pounds, the

weight of the sliver being 55 grains per yard. The card sliver is next run through either two or three processes of drawing as required for the quality of the canvas. In the sample three processes are used, six ends up at each process. The spread of the rolls for 1-inch stock with leather top rolls is as follows: front to second, 1⅛ inches; second to third, 1 3-16 inches; third to back, 1⅜ inches. For metallic top rolls spread of rolls ⅛ inch wider all through. Watch all stop-motions on this machine, for practically the last doubling is done at this machine, so that it is very important to see that the stop-motions are in good order. Varnish rolls as often as possible, and see that clearers are properly placed and picked. The sliver should be sized four times a day and should weigh 75 grains per yard. If humidifiers are used over these machines, they should give a mean temperature of 60 to 65 degrees. The drawing sliver is run through the slubber, and made into 40 hank roving. The settings for rolls at this machine are as follows: front to second, 1 1-16 inches, and second to back, 1¼ inches. Clean steel rolls of all laps, etc. The slubber roving is then put through two processes of fly frames, at the first intermediate being made into 1 hank roving and at the second, 3 hank roving. The roving on the finer frame should be sized once a day, the roll settings used for both being front to second, 1-16 inches and second to back, 1¼ inches; the doublings at each being 2 into 1.

AT THE SPINNING ROOM

the roving is spun into 14s on a warp frame with a 3-inch gauge of frame, 7-inch traverse, 2⅛-inch diameter ring, 17.77 twist per inch and a spindle speed of 9,000 revolutions per minute. This is then doubled into 6-14s or 6-ply 14s, after which it is put through a slasher and run on a beam.

The 14s filling yarn is made on a 1½-inch diameter ring, 6½-inch traverse, a 12.16 twist per inch and a spindle speed of 6,800 revolutions per minute. This yarn is then twisted into 9-ply 14s or 9-14s, after which it is conditioned, when it is ready to be woven.

BACK-CLOTH.

Back-cloth is a reinforcing cloth used in calico printing to support a fabric being printed. Any plain cloth of suitable width may be used as a back-cloth, therefore the term does not refer to any particular width, weight or quality of fabric.

The back-cloth passes through the printing machine between the machine and the cloth to be printed. Both cloths, the back and the printed, emerge from the printing machine together. The back-cloth is immediately folded, whereas the printed cloth goes through other machines to "set" the color. The color on the back cloth, not being "set," is easily washed out. In a public cloth finishing establishment, the back-cloth is usually bleached, after serving its purpose at the printing machine, and finished as required. The back-cloth is usually wider than the cloth it is intended to support, and the color touches it only lightly on the outer portions.

Appendix.

CRASH.

Carding and Spinning Particulars.

Crash is generally composed of yarns varying from 14s to 20s, both warp and filling having the same count of yarn. This class of fabric is made from cotton whose staple varies from ⅞ to 1 1-16 inches. For this article we will consider the counts of the yarn to be 16s and the staple of the cotton 1 1-16 inches in length. If large lots of this class of goods are to be handled, say over 35,000 pounds per week, preparing machines should be used, which are nothing more or less than several (from 3 to 7, according to capacity of mill) hoppers or openers in a row delivering the cotton on to an endless apron which carries it to and drops it into a line of trunking.

The cotton is conveyed to the mixing bins through this trunking, the motive power being powerful fans. This allows the cotton, when it reaches the bins, to be in a fluffy dry state. This cotton is next fed to the openers and is passed through three processes of picking. At the

BREAKER PICKER

the cotton passes through first a 3-bladed rigid type of beater, which has a speed of 1,100 revolutions per minute, and then a 2-bladed beater, the speed of which is 1,375 revolutions per minute. The total weight of a lap is 40 pounds, or a 16-ounce lap. At the intermediate picker the speed of the 2-bladed beater is 1,300 revolutions per minute, and the weight of the lap is 38 pounds, or a 13-ounce lap. At the finisher picker there is a pin beater (three arms) the speed of which is 1,350 revolutions per minute. The total weight of a 52-yard lap is 46 pounds net, or a 14⅛-ounce lap. Allow one-half pound variation either side of standard weight. At the card, set the same as for indigo prints. The top flats should make one complete revolution every 45 minutes. The sliver should weigh 60 grains per yard, and the production should be 775 to 825 pounds per week of sixty hours. Watch the setting points to see that all cards are set as nearly as possible alike. Strip three times a day and watch help to see that they strip every card. Grind as before stated. The sliver is next put through three processes of drawing frames. The speed of the front roll at the finisher for this stock should be 350 to 400 revolutions per minute, and the weight per yard of lap 75 grains. Watch the knock-off motions to see that they are all in proper working condition. For this class of work metallic top rolls may be used to excellent advantage. Size four times a day.

THE DRAWING SLIVER

is put through the slubber and made into .46 hank roving and from here put through two processes of fly frames, at the first intermediate being made into 1.10 hank, and at the second intermediate, or in this case the fine frame, 3.25 hank. Keep the top rolls in good condition and the bottom steel rolls set properly. This roving is taken to the spinning frame and spun into 16s warp yarn on a frame with 2¾-inch gauge of frame, 2-inch diameter ring, 7-inch traverse and spindle speed of 9,400 revolutions per minute. Twist per inch, 19. This yarn is then spooled, warped and put through the slasher, where it is heavily sized.

The 3-hank roving for the filling yarn is spun into 16s filling on a frame with 1⅝-inch diameter ring, 6½-inch traverse, 13 twist per inch and spindle speed of 7,000 revolutions per minute. After leaving the spinning frame, the yarn is conditioned.

HAMMOCK CLOTHS.

Carding and Spinning Particulars.

Hammock cloth is generally made in mills making low counts of yarn, or in mills or small plants which make a specialty of this one grade of goods. The counts as well as the staple of the cotton differ according to the quality of the fabric to be made. There is also another factor which enters into the manufacture of this class of fabric and that is its strength. Strength in yarn may be obtained by several different methods, either doubling and twisting two or more yarns together or using a longer staple, or a combination of both, always considering that machines through the mill are properly adjusted and set. Another method to obtain strength is to twist, tighten, or in other words put

in more twist per inch. For the sample of hammock cloth we will suppose it to be made up of 3-10s warp and filling, and we will assume the staple of the cotton to be ⅞ inch in length, straight cotton being used in the mixing. In the cheaper grades of this cloth comber and card stripping waste is put into the mixings in certain proportions. The cotton would be mixed by hand and

TWO PROCESSES

of picking used. The cotton should be allowed to stand as long as possible to dry out so as to be more easily worked, and it also lessens the liability of fires in the picker. The breaker picker should be a combination picker with two sets of screens and two beaters. The back beater has three blades and has a speed of 1,000 revolutions per minute. The forward beater has two blades and has a speed of 1,400 revolutions per minute. If the lap measures 40 yards, the weight should be 40 pounds or a 16-ounce lap. Generally, however, the lap is allowed to run as large as possible before being doffed. These laps are doubled 4 into 1, and come under the action of a two-bladed rigid beater, the speed of which should be about 1,375 revolutions per minute. The main points are to look out for fires, keep lappers very near full, watch the eveners and piano motions and keep all parts in good working order. The total weight of a lap at the finisher, for a 40-yard lap should be 37 pounds, or a 14½-ounce lap. Weigh every lap and allow a variation of three-quarters of a pound either side of standard. These laps are then put up at the card, which is fitted with coarse wire fillet.

THE DRAFT

should not be more than 90 and the speed of cylinder 165 revolutions per minute and the licker-in speed 350 revolutions per minute. Flats make one revolution every 50 minutes (110 flats). Strip cylinders three times a day and doffer two times. The weight of the sliver should be 65 grains per yard and the production not less than 950 pounds for a week of 60 hours. The cotton is next put through two processes of drawing frames, the doublings being 8 into 1 at the breaker and 6 into 1 at the finisher. The weight per yard at the finisher drawing should be 80 grains; size three times a day. Metallic rolls may be used to good advantage for this class of work. Watch all the knock-off and stop-motions at this machine and also look out for cut drawing. The roll setting for metallic rolls for seven-eighths inch stock is, front to second, 1⅛ inches, second to third, 1¼ inches, and third to back, 1½ inches. In a great many mills the sliver at the drawing frame is sized only twice a day. The cans of drawing are put up to and run through the slubber, which makes it into .60 hank roving, which is afterwards put through one process of fly frames and made into two hank roving. Size this class of roving once a day at the fine frame. Look out to see that the hank clock cannot be moved and hanks made. It is next taken to the spinning room and made into 10s for warp on a frame with 3-inch gauge of frame, 2¼-inch diameter ring, 7-inch traverse and spindle speed of 8,600 revolutions per minute, after which it is twisted into 3-ply 10s at twister, and then spooled, warped and put through the slasher. For the filling yarn the two hank roving is spun on a filling frame with a 1⅝-inch diameter ring, 7-inch traverse and spindle speed of 6,400 revolutions per minute, after which it is twisted into 3-ply 10s.

MADRAS.

Carding and Spinning Particulars.

Madras is made up of various counts of yarn according to the quality wanted, and in the finer qualities of this fabric, silk is used for the stripes. Egyptian or a fine Sea Island cotton is generally used in the finer qualities. In this article we will consider the filling yarn to be made up of 80s Egyptian cotton with a staple of 1⅝ inches. Egyptian cotton, generally speaking, is more easily worked than American cotton, and for this reason higher speeds are used than when the same counts of yarn are made from American cotton. The cotton is generally mixed by hand, after which it is put through three processes of pickers. At the breaker picker the speed of the three bladed beater is 1,050 revolutions per minute. The total weight of the lap at the front of this machine is 40 pounds, or an 18-ounce lap. At the intermediate picker the speed of a two-bladed beater is 1,450 revolutions per minute, while the total weight is 38 pounds, or a 12-ounce lap. These are put up at the finisher picker and run through a two-bladed rigid beater, the speed of which is 1,400 revolutions per minute. The total weight of a 50-

yard lap is 37½ pounds,or a 12½-ounce lap. Allow the usual amount of variation from standard weight of lap, and follow instructions for the picker room for high-grade and fine yarns. The cotton is next passed to the card.

THE DRAFT

of this card should not be less than 110. The top flats should make one complete revolution every 30 minutes. The speed of the licker-in should be about 350. The weight of the sliver is 50 grains and the production for this class of goods is 475 pounds per week of 60 hours. Strip, grind, etc., the same as when Sea Island cotton is used. In mills that are especially equipped for fine counts of yarn the wire on the card will be fine. After leaving the card, the full cans are put up to the sliver lap machine. In the general type used the machine has 16 ends doubled into 1 at the front. This lap weighs about 295 grains per yard. These laps are put up at the ribbon lap machine and doubled six into 1. The weight per yard of lap at this machine is 275. This is for a six-head comber. The comber is the next machine and at this machine the laps are doubled 6 into 1. The settings of this machine should be the same as when Sea Island cotton of the same length is used. The weight per yard of the combed sliver is 40 grains, and the speed of the comber 90 nips per minute. Several recipes for varnish for the leather-covered top rolls have been previously given and the following

RECIPE

will be found to be an excellent addition to those already given: Eight ounces of plate glue, 8 ounces of ground gelatine, 12 ounces of burnt sienna, one ounce of oil origanum, three pints acetic acid, one pint of water. The ribbon laps should be sized twice a day and a variation of five grains per yard either side of the standard weight allowed before changing. The combed sliver is next put through two processes of drawing frames, the weight per yard of a yard of finished drawing being 60 grains. The doublings at these machines are 6 into 1. Size the finishers four times daily and allow two grains per yard before changing. The cotton is next put through the slubber and made into .60 hank roving. This is then put through three processes of fly frames, at the first intermediate being made into 1.50 hank roving, at the second intermediate 4.50 and at the fine frame 16 hank. Egyptian cotton requires an extra tooth of twist as compared with Sea Island cotton of the same length of staple and hank roving. The middle top rolls on the fine or jack frame should not be dead weighted. This roving is taken to the spinning room and made into 80s yarn (filling) on a frame with a 1¼-inch diameter ring, 5-inch traverse, 29.07 twist per inch and spindle speed of 7,400. This yarn is then taken and conditioned.

GINGHAMS.

Carding and Spinning Particulars.

The yarns that make up ginghams (common) vary from 26s to 40s for both warp and filling. For the sample of gingham under description we will consider the yarns to be No. 40s for both warp and filling. This yarn would be made from a medium grade of peeler cotton of about 1 3-16-inch staple. The cotton after being put through a bale breaker or an opener known as a preparer is put through three processes of pickers at the breaker picker. The speed of the three-bladed beater should be 1,150 revolutions per minute, and of the two-bladed beater of the same machine, 1,400 revolutions per minute. The total weight of the lap should be 40 pounds, or a 16-ounce lap. At the intermediate the speed of the beater should be 1,400 for a rigid two-bladed beater. The total weight of lap should be 38 pounds or a 12½-ounce lap. The finisher picker should be equipped with a pin beater, the speed of which should be 1,425 revolutions per minute. The weight of a full lap should be 39 pounds or a 14-ounce lap.

At the card use the same settings, etc., as given for indigo prints. The flats should make one complete revolution every 50 to 55 minutes. Speed of doffer should be 350 revolutions per minute.

THE WEIGHT

of the sliver should be 60 grains per yard and the production 800 pounds for a week of 60 hours. The sliver is next put through three processes of drawing frames, the speed of the finisher drawing being 400 revolutions per minute. Watch the settings,and size at this place four times a day, a variation of two grains either side of standard weight being allowed.

The weight of the sliver at the fin-

isher drawing should be 70 grains per yard. Either metallic or leather covered top rolls may be used to good advantage on this stock. The drawing sliver is next put through the slubber and made into .60 hank roving. This is put through two processes of fly frames and made into 2 hank roving at the first intermediate and 8 hank at the second. Watch the tension and waste and be especially careful of mix-ups. Size the fine roving at least once a day. The roving is taken to the spinning room and made into 40s on a warp frame with a 1⅝-inch ring, 6½-inch traverse, 28.46 twist per inch and a spindle speed of 10,000 revolutions per minute. The yarn is then spooled and warped, after which it is run through the slasher. A good size is as follows: water, 100 gallons; potato starch, 54 pounds; Yorkshire gum, 2 pounds; white soap, 1½ pounds.

The 8 hank roving for filling yarn is made on a frame with 1⅜-inch diameter ring, 5½-inch traverse, 23.72 twist per inch and a spindle speed of 8,800 revolutions per minute. This yarn is then conditioned.

SCRIM.

Carding and Spinning Particulars.

Scrim is made of cotton counts of yarn from 20s to 40s. For this article we will consider the cotton to be 1 3-16-inch staple peeler of a medium of 32s count. This class of goods is made in mills of the first division as given in a previous article. Large mixings should be made by hand and the cotton is then put through an opener and three processes of pickers. The breaker picker has two sets of cages and two beaters, the back beater having three blades and making 1,050 revolutions per minute. The front beater has two blades and makes 1,300 revolutions per minute. The total weight of a 40-yard lap at this machine is 40 pounds, or a 16-ounce lap. The speed of the beater of the intermediate beater (two bladed) should be 1,400 revolutions per minute, and the total weight of the lap is 37½ pounds,or a 12-ounce lap. At the finisher the lap should weigh 39 pounds,or a 14½-ounce lap, while the speed of the beater (of a pin type) should be 1,400 revolutions per minute. Every lap should be weighed and a variation of half a pound either side of standard weight allowed to pass, all others being put back to be run over again.

THE CARD CLOTHING

should be of a medium count wire, the wire for doffer and top flats being two points finer than the cylinder. The draft of card should be about 100 and the sliver should weigh 65 grains per yard. The production should be 750 pounds for a week of 60 hours, For other particulars for card follow those given for indigo prints. The cotton is next put through the sliver lap machine and doubled 16 into 1, the lap weighing 320 grains per yard. These laps are put up at the ribbon lap and doubled 6 into 1, the weight per yard being 440 grains for a lap 10½ inches in width. These laps are put up to an eight-head comber and made into a 65-grain sliver, taking out 17½ per cent of waste. For roller varnish and other particulars about comber, see article on madras. The comber sliver is put through two processes of drawing frames, the doublings being 6 into 1 at each process. The weight per yard of the finished drawing is 75 grains. The same roller varnish may be used on the drawing frames as at the comber. Size four times a day and look out for the knock-off motions to see that they are in proper working order. The sliver is next put through the slubber and made into .60 hank roving. This is then put through two processes of fly frames or speeders, the hank roving at each being as follows: First intermediate 2 hank, and fine 6½ hank. Keep the leather top rolls in good condition and watch to stop double, single and bunches.

THE ROVING

is then taken to the spinning room and spun into 32s on a warp frame with a 1⅝-inch diameter ring, 6½-inch traverse, 26.87 twist per inch and spindle speed of 10,000 revolutions per minute. The yarn is then spooled, warped and run through the slasher, where it is put through a special size.

The roving for the filling is spun into 32s on a frame with a 1⅜-inch diameter ring, 6-inch traverse, 21.21 twist per inch and a spindle speed of 8,800 revolutions per minute. This yarn is conditioned.

Some of the white cloths, such as ducks, pique. etc., which in most seasons are always white, may be dyed to follow a freak of fashion.

CREAM.

For 100 pounds goods, two ounces immedial yelow D; 2 ounces immedial cutch B; 1 pound sulphite sodi-

um; 20 pounds salt; ½ pound soda ash.

MAUVE.

Two ounces diamine violet N; 10 pounds Glauber's; 1 pound sal soda.

ECRU.

One-half pound immedial cutch G; 4 ounces immedial yellow D; 2 pounds sulphide sodium; 10 pounds salt; 1 pound soda ash.

SKY BLUE.

One pound immedial indone B; 2 pounds sulphide sodium; 2 pounds soda ash; 10 pounds salt.

LIGHT SLATE.

One and one-half pounds immedial black N R T; 3 pounds sulphide sodium; 20 pounds salt; 2 pounds soda ash.

PIQUE.

Carding and Spinning Particulars.

The yarns for pique vary according to the quality wanted. A good quality and average grade of pique may be made from 30s yarns of 1⅜-inch peeler cotton (carded). After being put through a bale breaker the cotton is put through three processes of pickers, the speed of the beater at each process being as follows: 1,500 revolutions per minute (two-bladed beater) for the breaker picker, 1,400 for the intermediate picker (two blades), and 1,375 to 1,450 for the finisher picker, according to the grade of cotton used. The total weight of a finished lap should be 35 pounds or a 12½-ounce lap. At the card the draft should not be less than 100 or more than 110. The flats (110) make one revolution every 37 minutes. Strip three times a day. The weight of sliver should be 60 grains per yard; production, 750 pounds for a week of 60 hours.

The card sliver should be put through

THREE PROCESSES

of drawing frames. These should be equipped with leather covered top rolls, the speed of the front roll of the finisher drawing being 350 to 400 revolutions per minute, according to production required. The weight of the sliver from this frame should be 75 grains per yard.

This sliver is put through the slubber and made into .50 hank roving. For 9s filling yarn the slubber roving is put through one process of fly frames and is made into 2 hank roving. If a large quantity of pique is being made the yarn for 9s may be made of a much lower grade and staple of cotton, but otherwise it is better to construct the yarn by the method given.

The slubber roving for 30s yarn is put through two processes of fly frames, at the first intermediate being made into 2 hank and at the second being made into 7.50 hank. This roving is taken to the spinning room and spun into 30s on a warp frame having a diameter of ring 1¾ inches, length of traverse 6½ inches, twist per inch, 26.02 and a spindle speed of 9,800 revolutions per minute. This yarn is then spooled and warped, after which it is run through the slasher.

The No. 9s yarn is made on a filling spinning frame with a 1⅝-inch diameter ring, 7-inch traverse, 9.75 twist and a spindle speed of 6,200 revolutions per minute.

The 30s yarn is made on a frame with a 1⅜-inch diameter ring, 6-inch traverse, 19.17 twist per inch and a spindle speed of 8,300 revolutions per minute.

INDEX.

A

B

C

G

H

I

J

K

L

M

N

O

P

Q

R

S